Draft

Environmental Impact Report

Overall Program For Water Quality Management In South San Francisco Bay

South Bay Dischargers Authority

Bechtel Incorporated

December 1973

NOTICE

It is anticipated that a public hearing on this draft Environmental Impact Report will be held in the project area in early February 1974. Appropriate notice will be given in local newspapers.

Advance written comments on this draft report are solicited. These should be forwarded to:

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(TEAR SHEET)

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FOREWORD

Part I of this report was prepared by the Environmental Water Projects Department, Hydro and Community Facilities Division, Bechtel Incorporated, under the direction of Mr. John A. Peterson and in cooperation with the Environmental Services Department, Scientific Development Operation, Bechtel Corporation, under the direction of Dr. Ernst M. Miholits.

The balance of the report (Parts II – VI) was prepared by the Environmental Services Department.

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part I

Water Quality Management Plan

part I

Water Quality Management Plan

Section 1 Introduction

Section 1

INTRODUCTION

This is an overview environmental impact report on the program proposed by the South Bay Dischargers Authority for water quality management of South San Francisco Bay, and six viable alternatives to the Proposed Program.

In March 1972, a report prepared for the South Bay Dischargers Authority by Consoer, Townsend & Associates and Bechtel, Inc., was released, entitled: "Water Quality Management Plan for South San Francisco Bay." The report, referred to as the South Bay Report, analyzed a variety of alternative methods for improvement of the water quality of South San Francisco Bay, in conformance with interim water quality objectives established by the San Francisco Bay Regional Water Quality Board. The South Bay Report recommended an improvement program entailing consolidation and betterment of wastewater treatment facilities and conveyance of treated effluents to a point of disposal north of Dumbarton Bridge.

During the preparation of the South Bay Report, monthly meetings were held between the consultants' study team and representatives of the many cities and public agencies affected by the planning effort. These meetings were open and were frequently attended by other interested individuals. In addition, a number of public presentations were made to provide information on the progress and findings of the study and to obtain informal comments and suggestions for improvement. However, while environmental considerations were weighed in the selection of the plan recommended in the South Bay Report, no formal environmental impact

report has yet been prepared in conjunction with or on the program now proposed by the South Bay Dischargers Authority.

The plan presented in the South Bay Report has been modified to some extent by events subsequent to completion of the report. The modified plan, referred to as the "Proposed Program," is described in Section 2. The Proposed Program includes the following major elements:

- San Jose/Santa Clara Wastewater Treatment Plant (WTP)
- Sunnyvale WTP
- Palo Alto WTP
- Conveyance System — Interceptor/Outfall to the Bay north of Dumbarton Bridge.

Project reports on each of the above major elements will be prepared, as will detailed environmental impact reports.

In addition, at the request of the State Water Resources Control Board and the Environmental Protection Agency (EPA), this overview environmental impact report on the total program is prepared and submitted in advance of the individual project reports. The purpose of this report is to:

- Present information on the total wastewater management program for South San Francisco Bay.
- Discuss the environmental impacts associated with a program of this magnitude.
- Discuss the environmental impacts of the viable alternatives to the Proposed Program.
- Obtain comments on the overall program from public agencies and concerned individuals and groups, such that a program can be developed, as necessary, to reflect the optimum combination of economic, environmental and social considerations.

In this report is information relative to the environmental impacts of six viable alternative programs which bear on South Bay water quality. These are listed and summarized in Section 3. "Viable" alternatives are defined as those having the potential for being the most cost-effective, and which merit detailed environmental analysis.

Several other alternatives were examined at the "screening" level, and were determined not to be "viable," as defined above. These include:

- Discharges to the Bay north of San Mateo Bridge through a joint outfall serving San Mateo County agencies also
- Land disposal of effluents

Information is also presented in this report on the potential for wastewater reclamation and reuse under two options:

- Locally in Santa Clara County
- Regionally, with transportation to the Delta or San Joaquin Valley

The formal development of an environmental impact analysis of these reuse options for comparison with the Proposed Program would require that a specific project be formulated for each, including such items as description of proposed project facilities and their locations, and their interrelationship with other scheduled projects.

Investigations of these reuse options are still in the very preliminary stage, and detailed project formulation does not exist for them. Also, because of institutional and public health considerations, implementation of such major reuse appears to be many years away. In this report, the evaluation of the reuse options will be limited to consideration of their potential interrelationship with the Proposed Program and other viable alternatives.

The State guidelines for environmental impact report preparation provide for such conceptual treatment of alternatives. The guidelines in Section 15072 state: "A project involving only feasibility or planning studies for possible future actions which the agency, board or commission has not approved, adopted or funded does not require the preparation of an environmental impact report but does require consideration of environmental factors as required by Section 21102 of the California Environmental Quality Act."

part I

Water Quality Management Plan

Section 2 Water Quality Management Plan for South San Francisco Bay

Section 2

WATER QUALITY MANAGEMENT PLAN FOR SOUTH SAN FRANCISCO BAY

2.1 PURPOSE AND EVOLUTION OF THE PLAN

The disposal of liquid wastes is one of the most serious problems currently confronting urban areas located within the San Francisco Bay watershed. This problem has always been more acute in the southern portion of the Bay because of its relatively low freshwater inflow and poor tidal dispersion. In early years, disposal consisted only of transporting untreated wastes to the Bay for dilution and assimilation. As the population of the South San Francisco Bay area increased, however, treatment of wastewater became necessary. At first, treatment consisted only of the removal of settleable material from the flow. In response to stricter effluent and receiving water requirements imposed on the various dischargers by the San Francisco Bay Regional Water Quality Control Board, agencies discharging to the South Bay now operate or are constructing secondary treatment facilities to remove increased quantities of oxygen consuming organic materials. However, owing to the low assimilative capacity in the South Bay (south of Dumbarton Bridge) for increasing residual pollution loads, it has become apparent that additional water pollution control facilities must be constructed to meet present and anticipated water quality objectives.

Millions of dollars have already been spent on the construction of waste collection and treatment facilities in the South Bay area. The municipalities involved desire to comply with higher State and Federal requirements

for pollution control, but with a reasonable assurance that expenditures will contribute to a long-term solution to the problem of wastewater disposal.

In view of the major decisions to be made regarding water pollution control and because facilities will be required serving more than one agency, an association of dischargers, the South Bay Dischargers Authority, has been formed. The Authority consists of the Cities of San Jose, Santa Clara, Sunnyvale, and Palo Alto, An agreement was formulated on April 1, 1973, known as the Joint Exercise of Powers Agreement, to create the Authority. That agreement established the Authority's power to plan, acquire, construct, maintain, and operate a pipeline for joint disposal of wastewater.

Prior to the formation of the Authority, an informal organization of its member agencies, together with some other Bayside dischargers, undertook an investigation of the alternative, long-term solutions to water quality management problems in the South Bay area. The recommended plan was presented in the Consoer-Bechtel Report entitled, "Water Quality Management Plan for South San Francisco Bay," March 1972 (the South Bay Report).

2.2 BASIC FEATURES OF PLAN RECOMMENDED IN SOUTH BAY REPORT

The system recommended for the Bayside dischargers in the South Bay Report is shown in Figure 2-1. The system was selected on the basis of meeting interim water quality objectives, cost effectiveness, flexibility, and reliability. The system consisted of major subregional treatment plants at San Jose/Santa Clara, Palo Alto, and Newark (Union Sanitary District), together with two interceptor/outfall systems with discharge through diffuser sections to a common disposal point in an area north of the Dumbarton Bridge.

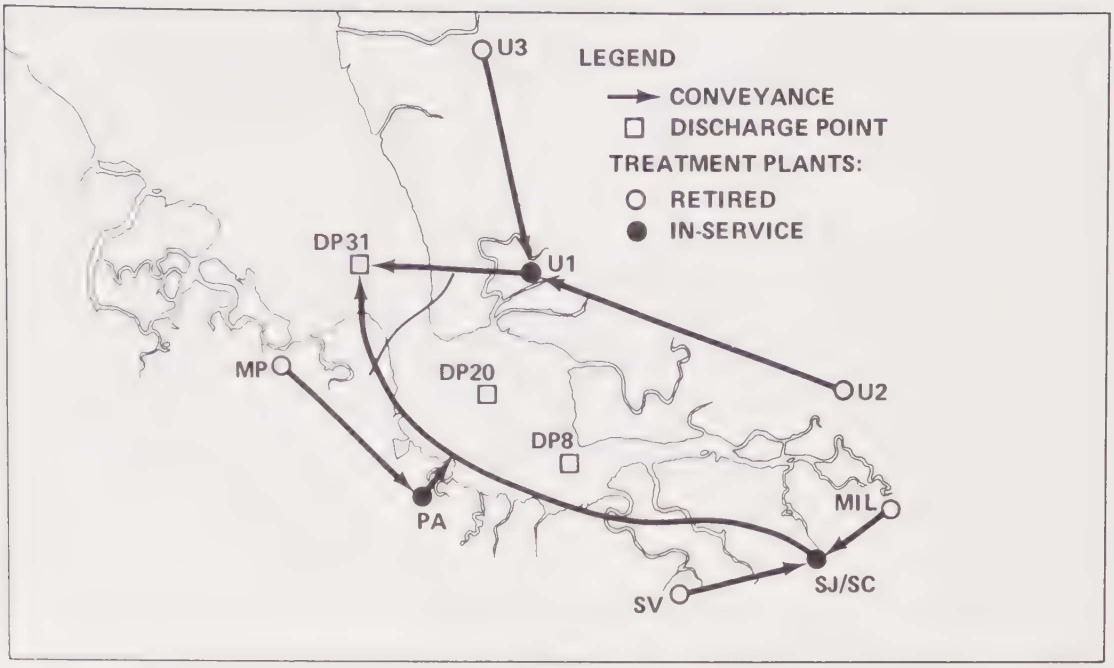


Figure 2-1. "Recommended Plan" from the South Bay Report.

The major features of that recommended sytem included:

- The dual interceptor and outfall systems which would collect treated wastewaters from the San Jose/Santa Clara, Palo Alto and Newark subregional plants.
- Consolidation of Milpitas with San Jose/Santa Clara for wastewater treatment by 1975, Sunnyvale with San Jose/Santa Clara by 1980, and Menlo Park with Palo Alto by 1980.
- General upgrading of the level of treatment at all plants to include filtration and substantial nitrification.
- Expansion and improvement of facilities based on achieving required improvements in receiving water quality at the least cost.
- Export of treated water out of the South Bay area.
- Staged construction to meet short-term (10-15 years) requirements.

The first stage of treatment facilities improvements were selected to meet anticipated 1985 flows. Additions could be provided in the future when and as the need arises. Conveyance facilities were sized for anticipated year 2000 peak wet weather flow rates.

2.3 RATIONALE FOR PLAN RECOMMENDED IN SOUTH BAY REPORT

The rationale for selection of the recommended plan from among the alternatives considered was developed and discussed in detail in the South Bay Report. Table 2-1 summarizes the major considerations on which the selection was based.

An important factor bearing on the selection of the water quality management plan recommended in the South Bay Report was the stated intention by the San Francisco Bay Regional Water Quality Control Board to prohibit certain discharges to the Bay south of Dumbarton Bridge. That intention was stated in the Board's Interim Water Quality Control Plan as follows:

> "It is the intention of this Regional Board to adopt prohibitions no later than July 1, 1973, for all waste discharges which have not had substantially all toxicants and biostimulants removed to the following areas of limited tidal interchange:
>
> a. South San Francisco Bay and the northern and eastern end of the Bay system.
>
> b. Any embayment, slough, creek, or other confined or shallow water area.
>
> The details of the specific areas from which such wastes are to be excluded and the scheduling for removal of existing discharges into those areas will be specified in the prohibition."

The Board has not invoked the prohibition. Whether it will ever do so is uncertain.

Table 2-1

BAYSIDE DISCHARGERS RECOMMENDED PLAN RATIONALE*

Water Quality

Meets definitive water quality objectives by 1976 and thereafter.
Insures significant improvement with respect to toxicants and biostimulants.
Satisfies prohibition of discharge with 200 feet offshore from extreme low water line.
Provides high degree of system reliability.
Protects beneficial uses of South Bay waters.
Provides recovery of the South Bay system from presently increasing pollutional lands.

Costs

Given the prohibition of discharge to the bay south of Dumbarton Bridge, select the plan which

Has lowest initial investment
Has lowest annual expenditures

Flexibility

Phased plan meets near term objectives
Phased plan has inherent flexibility to meet changes in:
- Population growth rate
- Water Quality objectives
- Technology

Phase I (1975-76 Implementation):
- Treatment plants sized for 1985 loads
- Conveyance system sized for 2000 peak flows

Phase II Options (1983-84 Implementation):
- Expand existing plant capacity
- Provide higher treatment levels
- Extend outfall toward central bay
- Convey to ocean
- Develop water reuse market

Institutional

Feasible under existing laws
Provides method to establish an authority for administration, allocation of costs, construction facilities, and monitoring of effluent as desired by South Bay Dischargers.

*See Reference 1.

Another important factor is the existence, in the Interim Plan, of a prohibition of discharge of any sewage bearing wastewater within 200 feet offshore from the extreme low-water line at any point inland from the Golden Gate.

2.4 PROGRAM PRESENTLY PROPOSED BY SOUTH BAY DISCHARGERS AUTHORITY

A number of important developments have occurred subsequent to the completion of the South Bay Report:

- The City of Sunnyvale has indicated its intention to continue operation of its wastewater treatment facilities, with appropriate improvements, rather than to transport wastewater to the San Jose/Santa Clara plant for treatment.
- Union Sanitary District has elected to participate in a regional program serving East Bay dischargers, rather than participate in the South Bay program. Union will consolidate its treatment facilities at a single regional plant, with the effluent therefrom transported to the deep waters of the Bay near Oakland International Airport. This outfall pipeline will also serve the cities of Hayward, San Leandro, and the Oro Loma Sanitary District.
- The City of Menlo Park will almost certainly not join the South Bay Dischargers Authority. The recently-completed San Mateo County subregional plan (2) recommends that Menlo Park abandon its existing facilities and transport wastewaters northward for treatment at a regional facility at Redwood Shores. The City has reviewed the proposal and has expressed an intent to follow that course of action. As of the date of this draft report the City had not reached full agreement on the terms under which it will participate in the San Mateo County subregional program.
- The City of Milpitas has reached agreement with San Jose/Santa Clara on a plan for abandonment of the Milpitas treatment plant, and treatment of Milpitas waste flows at the San Jose/Santa Clara plant. This plan will be implemented in the near future.

Thus, the program for water quality management in South San Francisco Bay now proposed by South Bay Dischargers Authority, and referred to herein as the Proposed Program, consists of the following major elements (Figure 2-2):

- An interceptor and outfall pipeline which would collect treated wastewaters from the San Jose/Santa Clara, Sunnyvale, and Palo Alto treatment plants and convey these wastewaters to a disposal point in the deep waters of the Bay in an area north of the Dumbarton Bridge, off Ravenswood Point.
- Consolidation of Milpitas with San Jose/Santa Clara for wastewater treatment, in the near future.
- General upgrading of the level of treatment at the San Jose/Santa Clara, Sunnyvale, and Palo Alto treatment plants.
- Expansion and improvement of facilities based on achieving required improvements in receiving water quality at the least cost.

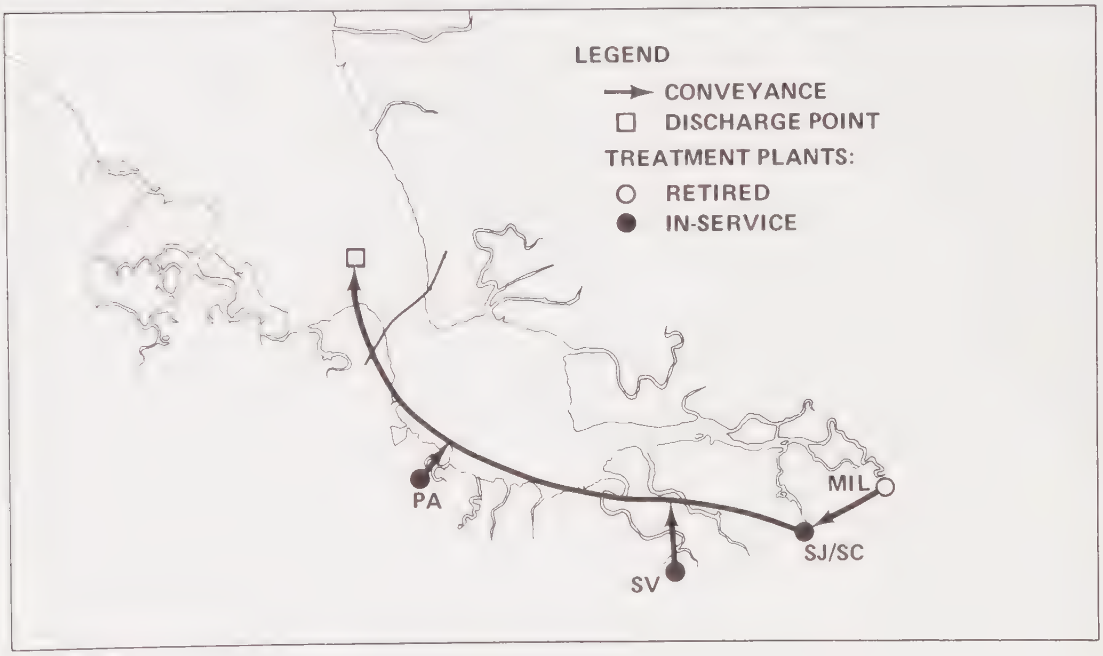


Figure 2-2. The Proposed Program — Modification of the "Recommended Plan" of the South Bay Report

- Export of treated water out of the South Bay area.
- Staged construction to meet short-term (10-15 years) requirements, as in the South Bay Report.

The environmental impact of this Proposed Program is the subject of this report. It is emphasized that, although the Proposed Program is the one presently viewed as being the best for water quality management in the South Bay, it can and will be modified as appropriate to consider valid new information such as comments received after review of the draft of this report.

2.5 FEATURES OF THE PROPOSED PROGRAM

2.5.1 Joint Outfall Pipeline

The proposed conveyance pipeline will consist of approximately 16 miles of buried pipe, from 7.5 to 8.5 feet inside diameter, and pumping facilities to transmit the treated effluent from each of the subregional treatment plants. Other support structures and facilities will include hydraulic control structures, emergency bypass structures, electromechanical controls and auxiliaries, and a diffuser section in the deep water portion of the Bay to achieve proper dilution and dispersal of the effluent.

In the project report for the interceptor/outfall, now under preparation, a number of alternative pipeline alignments are being evaluated from the engineering, economic and environmental viewpoint. An evaluation will be made of the potential for staging of the outfall facility in order to retain maximum flexibility for wastewater reclamation and reuse in the Santa Clara Valley. Consideration will also be given to the potential for minimizing the required size of the pipeline through provision of storage to hold peak effluent flows at the treatment plants.

The conveyance pipeline and associated connecting lines and facilities will be located along the west shore of San Francisco Bay, from San Jose to a

discharge point in an area north of Dumbarton Bridge off Ravenswood Point. Mathematical modeling studies conducted for the South Bay Report indicated that discharge to this area will meet receiving water quality standards established in the Regional Board's Interim Water Quality Control Plan. The modeling technique used did not provide for determination of the precise location of the diffuser section. Rather, it analyzed some 97 sections of the Bay from Point Richmond southward, and determined the ability of those sections to assimilate the wastewater load from the South Bay system. For the purposes of a feasibility or planning type study, this technique was adequate to determine the approximate disposal point. The optimum discharge location, within the general area now selected, will be determined during the project design stage utilizing more refined engineering studies, physical and/or mathematical modeling, and water quality studies.

The pipeline design will provide for future changes in discharge objectives with minimum loss of sunk investment. This flexibility will allow for: a future extension to a more northerly discharge location in the Bay, if operational experience indicates that this is necessary; upgrading of treatment facilities to meet changing water quality objectives; diversion of effluent to an ocean discharge; or delivery of effluent to the Delta or the San Joaquin Valley under a regional reclamation and reuse program.

The anticipated capital cost of the joint outfall pipeline is approximately $55 million (1976 price levels) including land costs, engineering, and administration. The project is scheduled for funding in fiscal year 1974-75 under the Clean Water Grant Program.

2.5.2 San Jose/Santa Clara Plant Improvements

Under the Proposed Program, improvements contemplated at San Jose/Santa Clara include biological nitrification and filtration. The facilities will be sized to accommodate the anticipated year 1985 population in the service area according to the State Department of Finance "E-Zero"

population projections, the corresponding design flow rate for which is 143 mgd. This is actually less than the capacity of the secondary treatment facilities of the plant (160 mgd). Thus, the improvements do not constitute an increase in the plant capacity, but rather a betterment of the level of treatment.

According to the water quality modeling studies conducted for the South Bay Report, the amount of 1985 flow required to be treated for removal of ammonia (through biological nitrification processes) is only about 95 mgd. This amount of nitrification would produce an effluent meeting the dissolved oxygen levels for the receiving waters stipulated in the Regional Board's interim water quality objectives (see Section 3 for further discussion). However, pilot plant studies recently conducted on the processes proposed at the plant indicate that a greater degree of nitrification may be necessary to reduce acute ammonium ion toxicity of the effluent to acceptable levels. Further investigations are proceeding, and final determination of the nitrification requirement will be made in the project report for the San Jose/Santa Clara plant improvements. For purposes of this draft report, it has been assumed that nitrification capacity of 95 mgd (year 1985 flows) will be provided at the San Jose/Santa Clara plant under the Proposed Program.

Final effluent filtration facilities will be provided for positive control of turbidity and floatables, to aid in achievement of coliform bacteria reduction to 2.2 MPN per 100 ml as required under the interim water quality objectives, and to provide reliability to the entire plant system in meeting required limits on effluent characteristics. These facilities will be sized for 1985 design flow of 143 mgd.

Dechlorination facilities are being added to the plant as a part of the secondary improvement program now nearing completion.

The anticipated capital cost of the San Jose/Santa Clara treatment plant improvements is approximately $45 million (1976 price levels). The cost will be greater if additional nitrification proves to be necessary. The project is scheduled for funding in fiscal year 1973-74 under the Clean Water Grant Program.

A general plant expansion to about 175 mgd capacity would be required in 1985 to meet anticipated year 2000 flows. This would include a further 25 mgd of nitrification facilities.

2.5.3 Palo Alto Plant Improvements

Improvements contemplated at Palo Also under the Proposed Program include provision of biological nitrification and filtration. The facilities will be sized to accommodate year 1985 "E-Zero" projected population. The anticipated 1985 average dry-weather flow to the plant is 26 mgd.

According to the water quality modeling studies conducted for the South Bay Report, the amount of nitrification required to meet receiving water dissolved oxygen objectives would be approximately 20 mgd (1985 flow levels). Pilot plant studies have not yet been undertaken at Palo Alto, and it may be that such studies would show the need for greater nitrification to meet acute toxicity objectives, as appears to be the case at San Jose/Santa Clara.

For purposes of this draft report, it has been assumed that 20 mgd of nitrification will be provided at Palo Alto. This is less than the 35 mgd capacity of the existing secondary facilities. Thus, the Proposed Program does not contemplate an expansion in plant capacity, but only a betterment in the level of treatment.

Final effluent filtration will be provided at the Palo Alto plant for the reasons discussed in the description of the proposed San Jose/Santa Clara plant improvements. The capacity will be 26 mgd, the 1985 design flow rate.

The Palo Alto plant has full dechlorination facilities at the present tiem.

The anticipated capital cost of the Palo Alto treatment plant improvements is approximately $9.0 million (1976 price levels). The cost will be somewhat greater if additional nitrification proves to be necessary. The project is scheduled for funding in fiscal year 1974-75 under the Clean Water Grant Program.

An additional 5 mgd of nitrification and 2 mgd of filtration facilities would be added in 1985 to meet projected year 2000 flows and water quality objectives.

2.5.4 Sunnyvale Plant Improvements

At Sunnyvale, improvements contemplated under the Proposed Program include flotation and filtration to remove algae and floating oil and grease from the plant effluent, dechlorination to reduce effluent toxicity, and miscellaneous minor facilities. In addition, nitrogen removal will be effected biologically in a trickling filter.

New facilities proposed at Sunnyvale will have a capacity of 22.5 mgd, equal to the present plant capacity. Thus, again, no increase in capacity is contemplated under the Proposed Program. A general plant expansion would be required by 1985 to meet flows projected for year 2000 (ultimate development).

The anticipated capital cost of the Sunnyvale treatment plant improvements is approximately $8.5 million (1976 price levels). The project is scheduled for funding in fiscal year 1973-74 under the Clean Water Grant Program.

part II

Water Quality Management Plan

Section 3 Alternative Water Quality Management Plans

Section 3

ALTERNATIVE WATER QUALITY MANAGEMENT PLANS

3.1 INTRODUCTION

There are a number of alternatives to the Proposed Program for management of the water quality of South San Francisco Bay. Most of these were evaluated in the South Bay Report, although additional information has been developed subsequent to the publication of that report. In this section the viable alternatives are briefly described and a summary evaluation of their relative environmental impact and other factors is presented. More detailed evaluations of the environmental impact of these alternatives are set forth in subsequent sections of this report.

A discussion is also presented of the potential for wastewater reclamation and reuse, locally and regionally, and an evaluation made of the ability of each alternative to accommodate such use.

The viable alternatives, in the order of their presentation, include the following:

- Alternative 1 — Modification of Proposed Program eliminating Sunnyvale plant. Combined treatment and disposal north of Dumbarton Bridge; wastewater treatment plants at Palo Alto, and San Jose/Santa Clara
- Alternative 2 — Local treatment and local disposal to the nearest deep water; wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/Santa Clara.
- Alternative 3 — High level local treatment and continuation of effluent discharge to existing disposal points; wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/Santa Clara

- Alternative 4 — Modification of Alternative 3 eliminating Sunnyvale treatment plant. High level local treatment and continuation of effluent discharge to existing disposal points for Palo Alto and San Jose/Santa Clara; wastewater treatment plants at Palo Alto, and San Jose/Santa Clara
- Alternative 5 — Ocean Disposal; wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/Santa Clara.
- Alternative 6 — "No Project". Wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/Santa Clara.

3.2 ALTERNATIVE 1

This alternative to the Proposed Program, shown in Figure 3-1, would be essentially the same as the Proposed Program except that operations at the Sunnyvale treatment plant would be discontinued by 1980 with wastewater flows tributary thereto being transported to the San Jose/Santa Clara plant for treatment. In all other respects, the concept of this alternative would be identical to that of that Proposed Program. A raw wastewater pipeline would be required from Sunnyvale to the San Jose/Santa Clara plant, and the effluent pipeline from San Jose/Santa Clara back to the Sunnyvale plant site would be slightly larger than under the Proposed Program.

Under this alternative, the same basic treatment processes as contemplated under the Proposed Program would be employed at the San Jose/Santa Clara and Palo Alto treatment plants. Palo Alto plant capacities would be identical to those in the Proposed Program.

Capacities of facilities at the San Jose/Santa Clara plant would be somewhat greater than under the Proposed Program, to accommodate the Sunnyvale flows. Initial filtration facilities provided in 1975 would have a capacity of about 160 mgd, equal to the existing secondary facilities. Nitrification capacity would be 105 mgd. In 1985 the secondary facilities and filtration unit would be expanded to about 200 mgd capacity, to meet anticipated year 2000 flows, and an additional 30 mgd of nitrification capacity would be added.

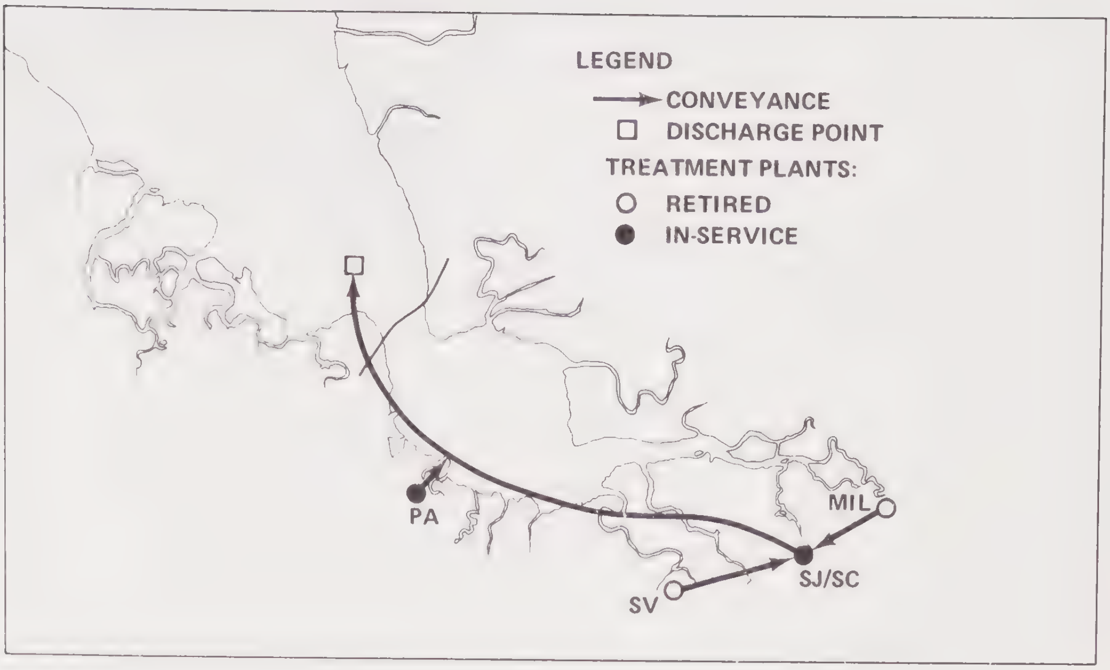


Figure 3-1. Alternative 1 — Modification of Proposed Program eliminating Sunnyvale plant. Combined treatment and disposal north of Dumbarton Bridge; wastewater treatment plants at Palo Alto, and San Jose/Santa Clara.

This alternative is included for consideration because the concept of retention of the Sunnyvale treatment plant as a sub-regional facility, with the improved treatment processes proposed by the City, has not been endorsed without reservation by either the Regional Water Quality Control Board or the State Water Resources Control Board.

3.3 ALTERNATIVE 2

Under this alternative (shown in Figure 3-2), improved treatment would be provided individually at the Palo Alto, Sunnyvale, and San Jose/Santa Clara plants, with Milpitas transporting flows to the San Jose/Santa Clara plant for treatment in accordance with present agreements dated July 10, 1973.

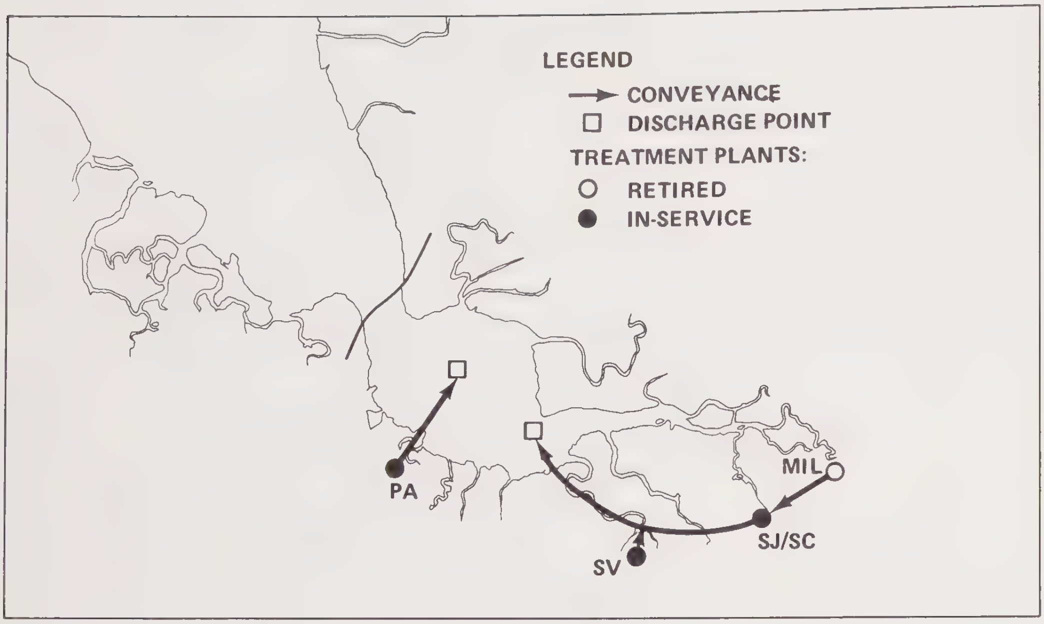


Figure 3-2. Alternative 2 — Local treatment and local disposal to the nearest deep water; wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/Santa Clara.

With the prohibition of discharge of sewage-bearing wastewater within 200 feet offshore from the extreme low water line, set forth in the Regional Board's Interim Plan, it would be necessary to provide outfalls from the three individual treatment plants to nearest deep water in South San Francisco Bay.

As shown in Figure 3-2, this alternative considered an outfall facility from the Palo Alto plant to deep water offshore from the Palo Alto yacht harbor, and a joint outfall serving the Sunnyvale and San Jose/Santa Clara plants with a discharge location off Calaveras Point. Both outfalls would discharge to the navigation channel in the South Bay to obtain the maximum effect of tidal exchange and to get sufficient depth of water over the diffuser sections to avoid creation of navigational hazards.

Under this alternative, the basic treatment processes and capacities described previously for the San Jose/Santa Clara, Sunnyvale and Palo Alto plants under the Proposed Program would be employed initially, except that 105 mgd of nitrification capacity would be required at San Jose/Santa Clara. Year 1985 plant expansions would also be the same as for the Proposed Program, except that nitrification added at San Jose/ Santa Clara would amount to 35 mgd.

3.4 ALTERNATIVE 3

Under this alternative (shown in Figure 3-3), all effluent conveyance and disposal facilities would be eliminated, and a degree of treatment would be provided at the San Jose/Santa Clara, Sunnyvale, and Palo Alto plants adequate to permit an indefinite continuation of effluent disposal at the present points of discharge (Artesian Slough, Guadalupe Slough, and an unnamed mud flat channel, respectively).

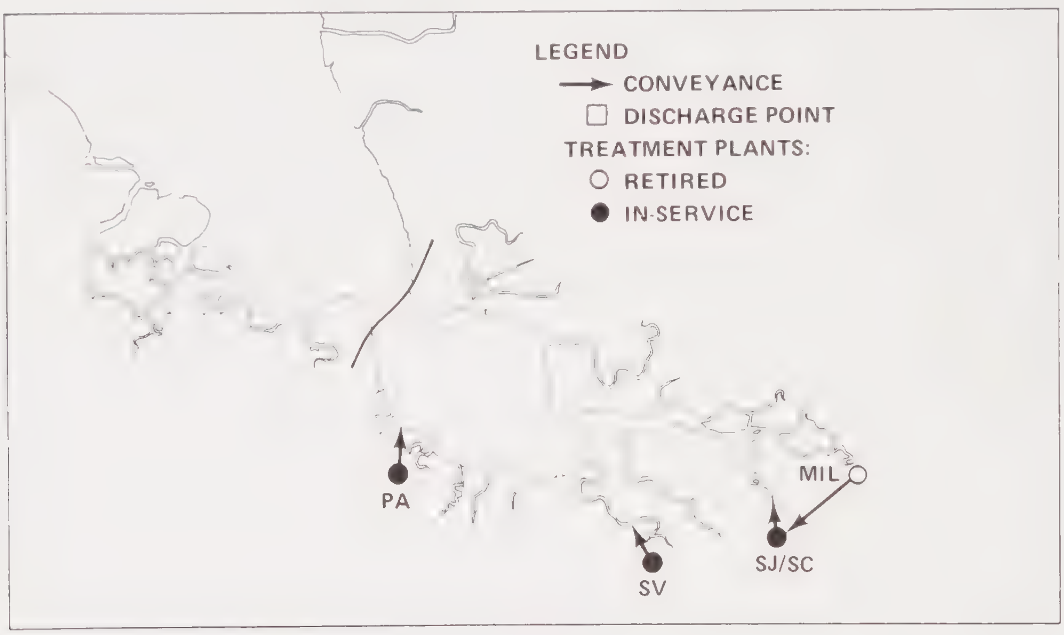


Figure 3-3. Alternative 3 — High level local treatment and continuation of effluent discharge to existing disposal points; wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/ Santa Clara.

Such an operation would not be permissible under the Regional Board's Interim Water Quality Objectives, now in effect for San Francisco Bay, because it would violate the prohibition of discharge within 200 feet of the extreme low water line. However, new water quality objectives have been proposed for the Bay, as discussed in sub-section 3.9 of this Section. Discharges within 200 feet of the extreme low water line would be permitted under these objectives, so long as the effluents being discharged do not have "characteristics of concern to beneficial uses".

To postulate appropriate treatment processes at the three plants, it was first necessary to establish receiving-water quality objectives to be met. Because the alternative cannot meet Interim Plan Water Quality Objectives and Prohibitions in any event, the treatment processes were formulated around the proposed Basin Plan Water Quality Objectives (see sub-section 3.9). Under those objectives, the minimum permissible dissolved oxygen concentration in the South Bay and the major tributaries thereto could range from 5.0 to 5.5 mg/l seasonally, on an interim basis. A simplifying assumption made was that the minimum 5.0 mg/l would be an acceptable objective throughout the study area. This assumption is the most favorable in terms of impact on the cost of treatment required under the alternative.

The discharge from the San Jose/Santa Clara treatment plant is into the head of the Artesian Slough which is an element of the Alviso Unit of the San Francisco Bay National Wildlife Refuge.

Because these discharges have a high U.O.D., and a high concentration of toxicants, the D.O. concentration is near zero, resulting in freshwater-associated habitats of a low diversity. Discontinuation of wastewater discharge to the slough would result in reversion to a saline estuary, preferable to continuation of existing conditions from the standpoint of developing diverse habitats.

However, under conditions of planned continued effluent discharge to Artesian Slough (Alternatives 3 and 4), it is believed that maintenance of 5 mg/l of D. O. in the slough and reliable and effective control of toxicants at the source and/or at the treatment plants would be necessary to enhance freshwater-associated habitats. Such enhancement of a freshwater habitat could result in increased diversity of animal species and restoration of populations of resident waterfowl, a definite benefit for the Wildlife Refuge.

The treatment process at the San Jose/Santa Clara plant necessary to maintain dissolved oxygen concentrations approaching 5.0 mg/l in Artesian Slough would include the existing primary and secondary facilities, with the addition of biological nitrification, residual ammonia removal through breakpoint chlorination, filtration, and adsorption on activated carbon for further reduction of oxygen-demanding substances and toxicants.

Provision of this treatment to the anticipated 1985 flow of 143 mgd, corresponding to "E-Zero" population growth, would result in a calculated discharge of oxygen demand to Artesian Slough of 11,000 pounds per day. Even with such treatment, this discharge may not permit maintenance of 5.0 mg/l in all reaches of the slough, and it could be necessary to provide a short pipeline to convey effluents to Coyote Creek for disposal.

Determination of "beneficial uses", and treatment processes required to meet them at the Palo Alto and Sunnyvale plants, was more difficult than for the San Jose/Santa Clara plant. As a minimum, it was assumed that the same treatment processes required under Alternative 2 would be needed, but that outfall facilities could be eliminated. This assumption is the most favorable in terms of impact on the cost of treatment required under Alternative 3.

3.5 ALTERNATIVE 4

This alternative (shown in Figure 3-4) would be essentially the same as Alternative 3, except that operations at the Sunnyvale treatment plant would be discontinued by 1980, with wastewater flows tributary thereto being transported to the San Jose/Santa Clara plant for treatment. Initial tertiary facilities provided at San Jose/Santa Clara would have a capacity of about 160 mgd, equal to the existing secondary facilities. In 1985 the entire plant would be expanded to about 200 mgd capacity, to meet anticipated year 2000 flows.

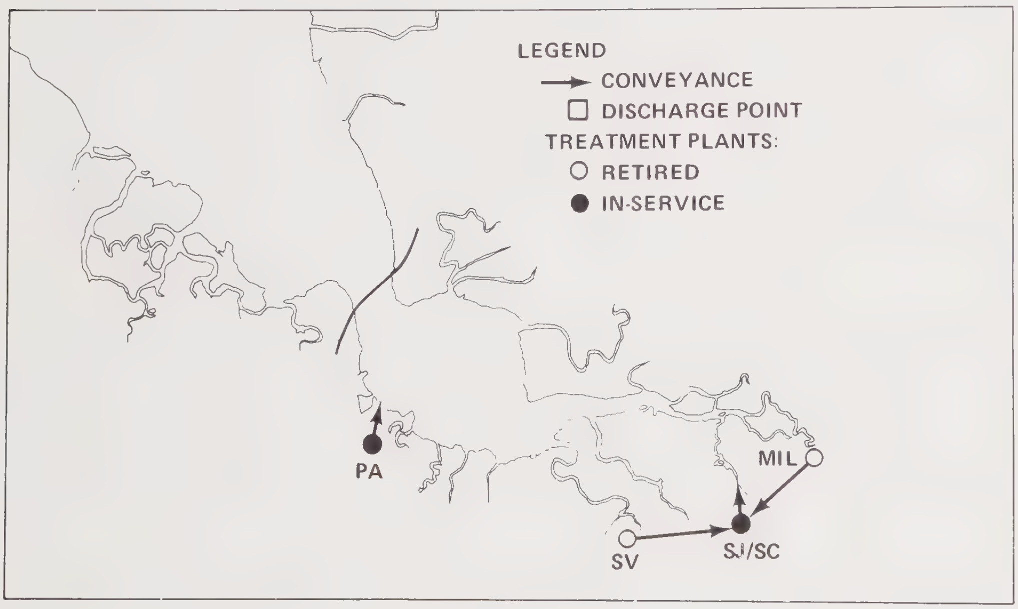


Figure 3-4. Alternative 4 — Modification of Alternative 3 eliminating Sunnyvale treatment plant. High level local treatment and continuation of effluent discharge to existing disposal points for Palo Alto and San Jose/Santa Clara; wastewater treatment plants at Palo Alto, and San Jose/Santa Clara.

3.6 ALTERNATIVE 5

The system shown in Figure 3-5 would provide for wastewater treatment at the Palo Alto, Sunnyvale, and San Jose/Santa Clara plants and conveyance of effluent from San Jose/Santa Clara and Sunnyvale to Palo Alto

via an on-shore pipeline. From the Palo Alto plant, the treated effluent would be conveyed to the Pacific Ocean via a pipeline and tunnel through the Santa Cruz mountains. The outfall would enter the ocean at a point about six miles south of Half Moon Bay, and would extend into the ocean about seven miles, or far enough to reach a depth of 200 feet.

For disposal to the ocean, it was assumed that existing biological facilities at Palo Alto, Sunnyvale and San Jose/Santa Clara could be utilized with little modification. Expansions would be required at Sunnyvale and San Jose/Santa Clara to meet the anticipated year 2000 flows. Recently-promulgated regulations for disposal of wastewaters to the Pacific Ocean indicate that chemical treatment might be a requirement for this alternative. If so, the cost of the alternative would be greater than the estimates summarized herein.

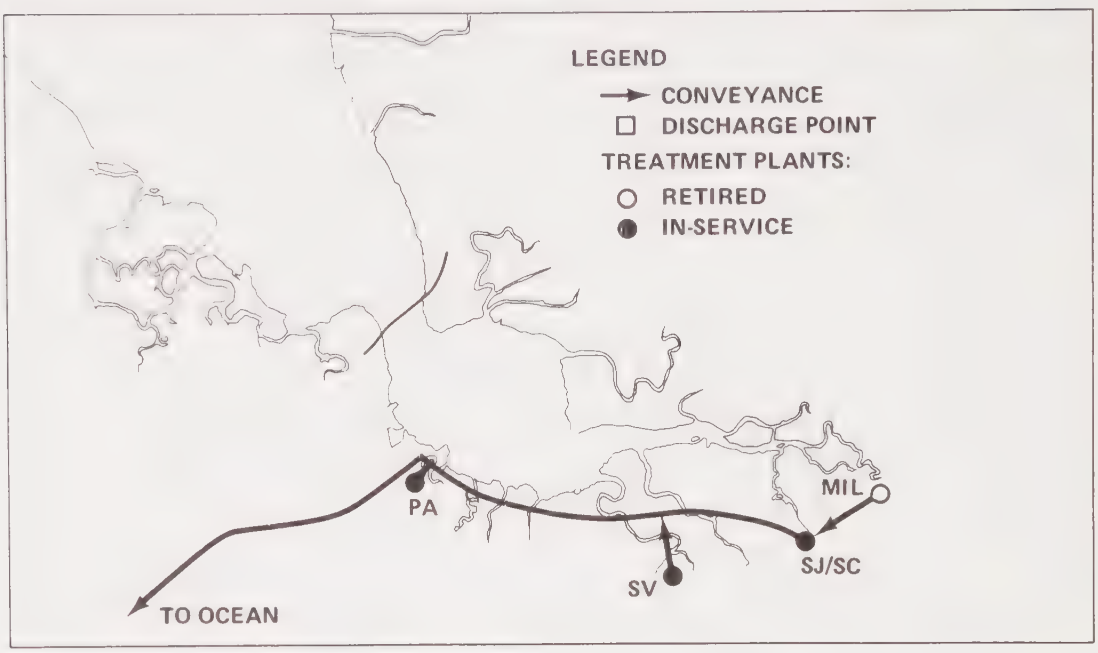


Figure 3-5. Alternative 5 — Ocean Disposal; wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/Santa Clara.

3.7 ALTERNATIVE 6

Under the "No Project" alternative (see Figure 3-6), all sub-regional facilities currently in operation, under construction, or in final design stage would be considered to be included, but no new facilities would be provided through the year 2000. Specifically, it is assumed that secondary plant additions currently under construction at San Jose/Santa Clara would be operational under the "No Project" alternative, and that the Milpitas treatment plant would be phased out, with Milpitas flows being transferred to San Jose/Santa Clara in accordance with the agreement of July 10, 1973.

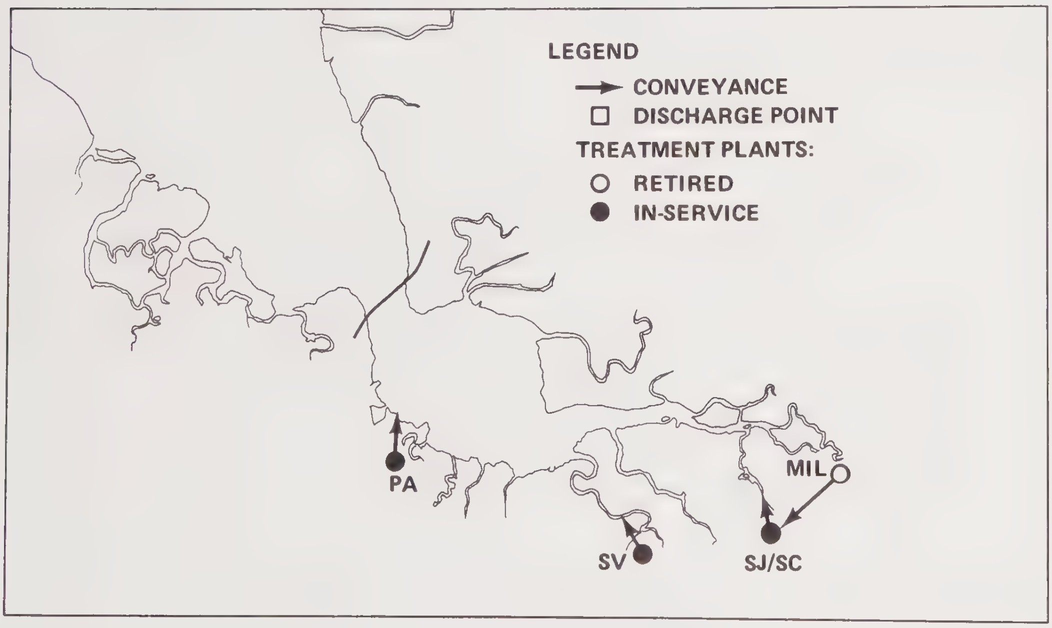


Figure 3-6. Alternative 6 — "No Project". Wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/Santa Clara

3.8 REGIONAL RECLAMATION AND REUSE CONSIDERATIONS

A potential exists for substantial reclamation and reuse of wastewater for groundwater recharge in Santa Clara County, northern San Benito County, and portions of Santa Cruz and Monterey Counties. In addition, an evaluation is presently being made by state and local agencies of the potential for reuse of surplus Bay Area wastewaters, on a regional basis, for augmentation of outflows to the Sacramento-San Joaquin Delta and for agricultural use in the San Joaquin Valley. These major potential reuse schemes are described in the following paragraphs. In addition, there is potential for limited local reclamation and reuse in the vicinity of each of the sub-regional treatment plants. Such local projects would have but slight impact on the need for facilities to improve water quality in the South Bay, and have not been evaluated herein.

3.8.1 Reuse in Santa Clara Valley

In the South Bay Report, reclamation and reuse in Santa Clara County was considered as an alternative to Bay or ocean discharge of South Bay wastewaters. Subsequent to the completion of that report, the Santa Clara County Flood Control and Water District contracted with the joint venture of Consoer, Townsend & Associates and Bechtel to perform more detailed studies of the potential for wastewater reuse within the County. The principal objectives of the study were to examine in more detail the potential market for reclaimed water within the County, and to evaluate the potential for reclaimed wastewater as a supplemental water supply source in comparison with the San Felipe Project proposed by the U.S. Bureau of Reclamation. The Consoer-Bechtel report was released in July of 1973.

The Consoer-Bechtel report examined the need for supplemental water supplies within the proposed service area of the San Felipe Project, shown on Figure 3-7. On that figure, the service area is divided into three subareas: north Santa Clara County, south Santa Clara County, and the

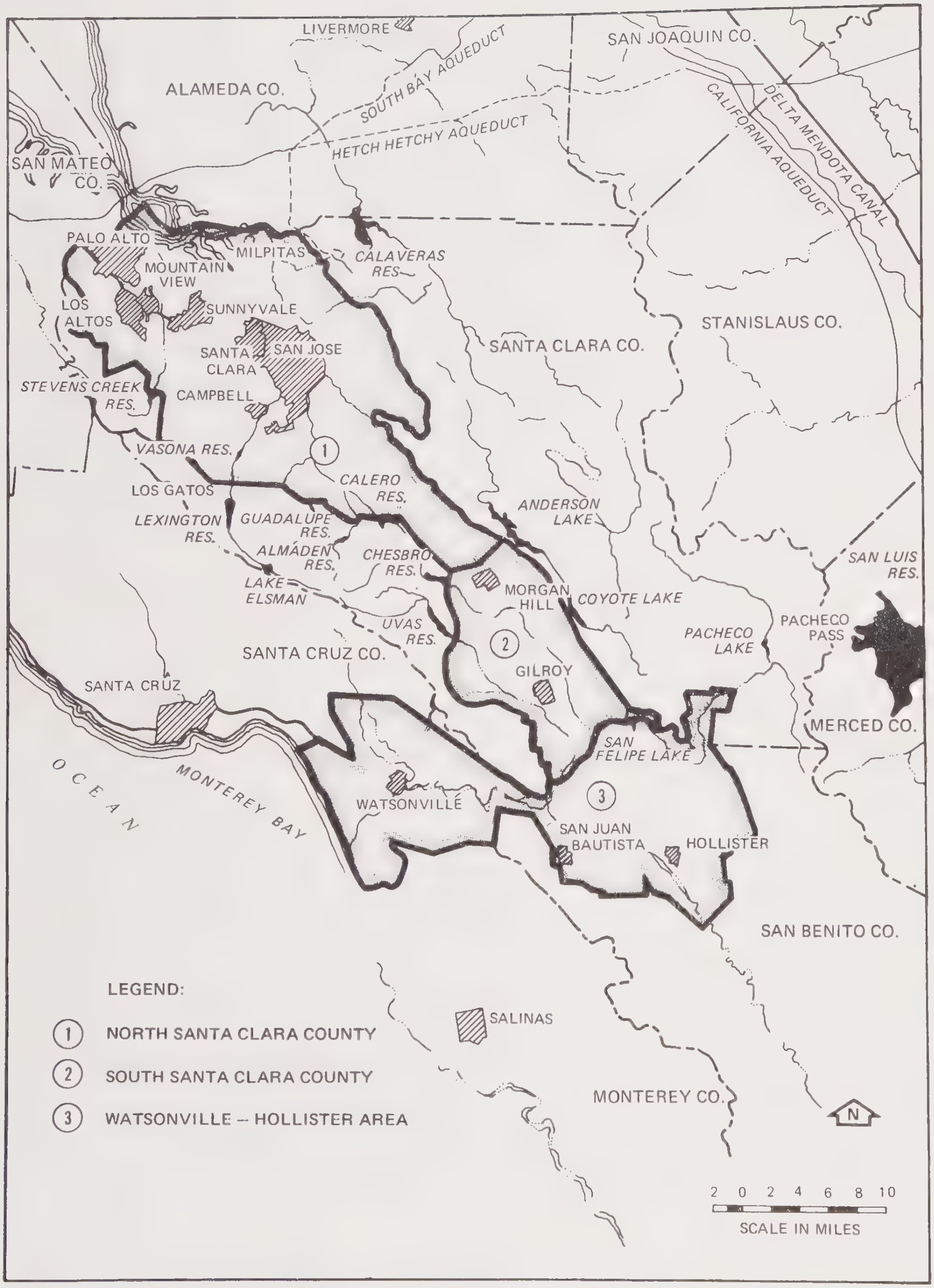


Figure 3-7. Service Area of Proposed San Felipe Project

Watsonville-Hollister areas of San Benito, Santa Cruz, and Monterey Counties. Subsequent to completion of the Consoer-Bechtel report, the Flood Control District and the Bureau of Reclamation collaborated in a joint re-evaluation of anticipated water requirements and supplies within Santa Clara County. This work resulted in some adjustments to the data presented in the Consoer-Bechtel report. The most recent estimates of supplemental water requirements within the three sub-areas cited above are set forth in Table 3-1, through the year 2000.

The major source of water supplies within all three of the sub-areas is groundwater. As noted in the Consoer-Bechtel report, percolation facilities in the northern County area operated by the Flood Control District have characteristics such that it would be possible to percolate reclaimed water into the groundwater basin underlying the north county sub-area at a constant rate throughout the year. Although the characteristics of the groundwater basins in the other two sub-areas are less well-known, it is assumed that comparable recharge facilities could be provided to supply those areas. Under this assumption, it would be possible to supply the supplemental water requirements shown in Table 3-1 from reclaimed wastewater without the need to size reclamation and reuse facilities for peak flows, and without need for seasonal storage facilities. The uniform annual rates of application of reclaimed water to percolation facilities thus required to provide the total supplemental water needs of the study area are also listed in Table 3-1.

It should be stressed that the water requirements shown in Table 3-1 are the maximum potential market for reclaimed wastewater in Santa Clara County and areas to the south, feasible of service from the San Jose/ Santa Clara, Sunnyvale and Palo Alto treatment plants. Provision of these quantities of reclaimed wastewater would meet real needs that would otherwise have to be supplied from alternative souces, such as the proposed San Felipe Project.

Table 3-1

SUPPLEMENTAL WATER REQUIREMENTS IN THE
SAN FELIPE SERVICE AREA

	Acre-Feet per Year		
	1980	1990	2000
North Santa Clara County (a)	11,300	51,300	74,100
South Santa Clara County (a)	13,900	29,100	31,800
San Benito & Santa Cruz County (b)	17,900	52,500	53,600
Total	43,100	132,900	159,500
(mgd) (c)	38.5	119.0	142.5

(a) Source: Santa Clara County flood Control and Water District

(b) Source: Reference 3

(c) Average annual supply rate required to meet the total supplemental requirements

The wastewater percolated to the groundwater basins would subsequently be withdrawn and used in part for domestic water supply. The State Department of Public Health, which has the responsibility of certifying the safety of public water supplies, has raised serious questions regarding the use of reclaimed water for domestic purposes, even after passage through a groundwater basin. Resolution of these problems may take considerable time, making near-term implementation of a regional reclamation and reuse program in Santa Clara County unlikely.

Notwithstanding the foregoing comments, it is of interest to evaluate the impact a reuse program in Santa Clara County might have on the need for water pollution control facilities in South San Francisco Bay. The projected future wastewater flows to the San Jose/Santa Clara treat-

ment plant are shown in Table 3-2, where its flows are compared with the maximum potential reuse in the San Felipe service area (assuming wastewater could be diverted to groundwater recharge at a constant annual flow rate). It can be seen that flows to the San Jose/Santa Clara plant exceed even the maximum potential reuse at all times. During wet weather, flows to the treatment plant are substantially in excess of the reuse potential.

Table 3-2

IMPACT OF POTENTIAL REUSE ON
SAN JOSE/SANTA CLARA POLLUTION CONTROL FACILITIES

	1980	1990	2000
Projected Flow at SJ/SC Plant(a), mgd			
Average Dry Weather(b)	127	151	175
Peak Wet Weather	202	253	306
Max. Potential Diversion to Reuse(c), mgd	39	119	143
Balance Discharged to Bay or Ocean, mgd			
Average Dry Weather	88	32	32
Peak Wet Weather	163	134	163

(a) Includes Milpitas flows

(b) Includes 31 mgd cannery flows, assumed constant throughout study period

(c) From Table 3-1, rounded

All flows passing through the San Jose/Santa Clara plant would have to receive the treatment anticipated under the Proposed Program, which includes secondary treatment, biological nitrification, and filtration. Flow destined for groundwater recharge would receive addition treat-

ment, which would probably include nitrogen removal for the entire amount reclaimed, and activated carbon treatment together with demineralization for a portion thereof. Thus, the regional reuse program would in no way lessen the need for treatment facilities at the San Jose/Santa Clara plant. Rather, additional facilities would be required.

Flows in excess of the amount reclaimed for reuse would need to be discharged to the Bay or the Pacific Ocean under one of the alternative schemes described previously in this section.

With respect to the joint outfall pipeline facility included in the Proposed Program, the impact on the facility of even maximum reclamation and reuse would be smaller than might be expected. Because of the need to avoid overflows, the outfall pipeline must be designed to carry peak wet weather flows. The proposed facility will be sized to carry the peak flow anticipated for year 1995, 279 mgd, away from the San Jose/Santa Clara plant. This will require a pipeline 7.5 feet (90 inches) in diameter. With maximum reclamation and reuse, this peak flow requirement would be reduced to about 145 mgd, a reduction of 48 percent. However, because the carrying capacity of a pipeline is approximately proportional to the square of its diameter, such a flow reduction would not result in a comparable pipeline designed to carry 145 mgd peak flow, with the same lead loss for the proposed line, would be 5.5 feet (66 inches) in diameter.

3.8.2 Interagency Water Reclamation Studies

The Interagency Wastewater Reclamation Study Committee has been organized to study the potential for reclamation and utilization of Bay Area wastewater resources to augment outflows through the Sacramento-San Joaquin Delta, either by direct introduction to the Delta or by substitution for freshwater flows that would otherwise be diverted from the Delta.

The principal participants in the Committee are the State Water Resources Control Board, the State Department of Water Resources, the United States Bureau of Reclamation, and the United States Army Corps of Engineers. Additional participation is being provided by local water and wastewater resource management agencies, the Regional Water Quality Control Board, the Department of Public Health, the Department of Fish and Game, the Environmental Protection Agency, and the University of California. The Committee's investigations began in early 1973, and a draft report on the findings is scheduled for release at the end of 1973.

In the conduct of the study, the quantity and quality of the wastewater resources of the lands tributary to San Francisco Bay are being examined; water quality requirements of the alternative potential uses are being identified; and reconnaissance estimates of the cost of the extended treatment and conveyance systems, together with the cost of required regulatory storage facilities, are being made. It is the stated intent of the Committee to in no way limit or preclude development of viable local water reuse projects, but rather to examine potential uses for surplus wastewater flows not feasible for local development.

The Committee has identified six basic concepts for reusing reclaimed Bay Area waters to augment Delta yield, as follows:

- Direct input to freshwater channels of the Delta
- Exchange with Delta exports for irrigation use and groundwater recharge in Santa Clara and San Benito Counties
- Use as industrial and power plant cooling water supply
- Exchange with Delta diversions for enhancement of the Suisun Marsh wildlife habitat
- Exchange with Delta exports for irrigation use in the western San Joaquin Valley
- Exchange with Delta diversions for water service to overland facilities to Delta Islands

One of these, groundwater recharge in Santa Clara and San Benito Counties, has been described previously herein. For the other concepts, the Committee is examining systems for conveying Bay Area wastewaters to several alternative aggregation points.

The regional program identified by the Committee as having the greatest potential for development would involve conveyance of dry-weather wastewater flows from San Francisco southward along the western shore of the South Bay, and from the Bay Bridge (E.B.M.U.D. plant) southward along the eastern shore. The conveyance systems would merge at an aggregation point near Alviso. Flows from the San Jose/Santa Clara plant would be added at that point, and the total would be conveyed southward through the Santa Clara Valley to Gilroy, thence eastward across the Diablo Range to a terminal reservoir near Los Banos. The re-regulated flows would be used for agricultural irrigation in the western San Joaquin Valley area.

The conveyance pipeline postulated for transport of wastewater flows on the west side of the Bay under this program would be 90 inches in inside diameter from Palo Alto to the San Jose/Santa Clara treatment plant. This is exactly the size of the joint outfall pipeline in the Proposed Program. Design operating heads for the pipelines would be comparable. Thus, the proposed outfall pipeline could readily be designed to serve as a component of the regional reuse system, to accommodate flows in the reverse direction. Provisions of this capability would add little to the project cost. Another significant potential regional reuse concept would involve aggregation of South and East Bay wastewater flows at a point on Alameda Creek downstream from Alvarado, in Alameda County. From this aggregation point, wastewaters could be transported eastward through the Livermore Valley to a re-regulating reservoir, possibly at the Kellogg site in southeastern Contra Costa County. From that point, the wastewater could be

introduced into the Central Valley system for irrigation purpose, released directly into the Delta for salinity control, or used to supply industries and power plants located along the shores of northern Contra Costa County and southern Solano County.

The facilities contemplated in the Proposed Program would be adaptable to this concept also. The proposed outfall pipeline could readily be extended across Dumbarton Narrows to the aggregation point, a distance of about 6 miles.

While implementation of such regional reuse programs of this type may be many years away, they have significance in that they offer the potential for reuse of almost unlimited quantities of wastewater. While treatment facilities would be required in the South Bay region, discharge of treated effluents to the South Bay could be totally eliminated if the effluents were conveyed to the reuse system.

3.8.3 Summary

It may be concluded that, while wastewater reclamation and reuse in the Santa Clara Valley may be desirable and should be pursued, it is not an "alternative solution" to the water quality problems of South San Francisco Bay. Substantially all of the water pollution control facilities included in the Proposed Program would be required even with such reuse. A regional program for reuse of Bay Area wastewaters could be of somewhat greater significance by totally eliminating discharges to the South Bay. Again, however, substantial treatment and conveyance facilities of the size and type contemplated under the Proposed Program would be required.

Implementation of either of these reuse programs will require resolution of many difficult institutional problems. The problems of public health protection and establishment of economic and financial feasibility are substantial.

It is important that any water pollution control program implemented in the South Bay region have the capability to accommodate reclamation and reuse, in Santa Clara County or elsewhere, when and as such can be instituted. The degree to which alternative water pollution control programs can adapt to reclamation and reuse with a minimum loss of sunk investment is an important factor in the evaluation of their desirability. It is imperative that no water pollution control program preclude the option of future wastewater reclamation and reuse.

3.9 ALTERNATIVE WATER QUALITY OBJECTIVES

3.9.1 Interim Bay Water Quality Objectives

At the present time, water quality objectives, effluent limitations, and discharge prohibitions in effect for San Francisco Bay are those set forth in the Regional Water Quality Control Board's Interim Water Quality Control Plan. Those objectives are reproduced in Appendix A of this report. The Proposed Program was formulated against those objectives.

Important elements of the Interim Plan water quality objectives are the provisions dealing with biostimulants and toxicity in wastewaters. Unfortunately, the objectives as written are not subject to definitive interpretation for use in planning studies. During preparation of the South Bay Report, the staff of the Regional Board elaborated on the above objectives in an attempt to provide specific planning criteria. The further criteria proposed by the Board staff for planning purposes are as follows.

- Biostimulants

  "Biostimulating substances shall not be present in the receiving waters in concentrations sufficient to cause deleterious biotic growths. For the purpose of this study, a biomass concentration of 50 micrograms per liter of chlorophyll a is considered to be the threshold concentration for causing deleterious biotic growths."

- Toxicity or Other Deleterious Substances

"No toxic or other deleterious substances shall be present in the receiving waters in concentrations or quantities which will cause deleterious effects on aquatic biota, wildlife, or waterfowl or which render any of these unfit for human consumption either at levels created in the receiving waters or as a result of biological concentration."

"Alternative waste treatment and disposal systems shall be evaluated for the following acute toxicity objective:

For Acute Toxicity

"Survival of test organisms in undiluted waste effluent samples in 96-hour bioassays will be used as a measure of acute toxicity.

Any single sample: A minimum of 70 percent
Average: A minimum of 90 percent

Average values will be computed from data collected over a three-month period; at least three monthly samples should be collected and tested."

"The recommended waste treatment and disposal system shall meet the following chronic toxicity objective:

For Chronic Toxicity

"Relative toxicity concentration in the receiving waters shall be less than 40 ml/l. This relative toxicity value for the receiving water should be computed using the method used in the San Francisco Bay Delta program...

Relative toxicity as computed from the following formula will be used as a measure of chronic toxicity:

$$\text{Waste Effluent Relative Toxicity (RT)} = (a)\frac{100\ Q}{96\text{-hr } TL_{50}}$$

Where Q = Flow rate of waste discharge

$96\text{-hr } TL_{50}$ = Volumetric concentrations of waste effluent sample used in toxicity bioassays in which 50 percent of the test organisms survive for 96 hours

(a)= a factor to be used as follows:

(a)= 1 for the waste effluents with 96-hr TL_m equal to or less than 100 percent

(a)= 0.5 for the waste effluents in which 90 or more percent of test organisms survive for 96 hours

(a)= 0.8 for the waste effluents in which 65 percent of test organisms survive for 96 hours."

While the above criteria were used for planning purposes in the South Bay Report, they are not an official element of the Interim Plan and there is no general agreement on these or any other specific criteria for toxicity or biostimulants.

3.9.2 Proposed Basin Plan Water Quality Objectives

Additional planning work is presently being conducted, on behalf of the State Water Resources Control Board, to formulate a "fully developed" Water Quality Control Plan for San Francisco Bay. This work is being carried out by an independent consulting engineer, termed the "Basin Contractor." As a part of the work, the Basin Contractor has reviewed the Regional Board's interim water quality objectives, and has proposed a new set of objectives which differ in some significant respects from those of the Interim Plan. These objectives, termed the proposed "Basin Plan Water Quality Objectives," are reproduced in Appendix B.

The major changes in South Bay water quality objectives affecting planning, which would result from adoption of the proposed Basin Plan Water Quality Objectives, can be summarized as follows:

- The proposed objectives provide that dissolved oxygen (D. O.) concentrations in the South Bay be maintained at "protection level B" as an ultimate objective, with a minimum concentration of 5.0 mg/l. However, it has been suggested that, during some interim period, D. O.

concentrations be allowed to fall to "protection level C" (see Figure 10 of Appendix B). A comparison of these objective D. O. levels with the seasonal median objective of 80 percent of saturation, stated in the Interim Plan, is tabulated below:

	D. O. Concentration, mg/l	
	Wet Season*	Dry Season*
Interim Plan	7.0	5.7
"Protection Level B"	6.9	5.8
"Protection Level C"	5.8	5.3

* In the South Bay, between San Mateo Bridge and Dumbarton Bridge. Numbers represent D. O. levels which should be aimed for as an objective, to ensure that "acceptable minimum" D. O. concentrations will be attained with 95 percent confidence.

It can be seen that "protection level B" is essentially the same as the Interim Plan, in terms of objective D. O. levels. "Protection level C", however, would permit a substantial reduction from Interim Plan D. O. levels for the South Bay.

- All waste discharges into the South Bay would be disinfected such that the median coliform concentration in areas "capable of supporting unrestricted shellfish harvesting" does not exceed 70 MPN per 100 ml, with not more than 10 percent of the samples exceeding 230 MPN per 100 ml.
- A limitation would be placed on allowable un-ionized ammonia concentrations in receiving waters, interpreted to apply outside of "initial dilution zones" around outfall points.
- The objectives for chronic toxicity would be expressed in terms of concentrations of specific toxicants measured in the receiving water, rather than on bioassay results as is indicated in the Regional Board's elaboration of the Interim Plan water quality objectives. An effluent limitation for acute toxicity, as measured by bioassay, would be imposed as is the case in the Interim Plan.
- A prohibition of effluents containing residual chlorine would be imposed.

- There would be no prohibition of discharges "within 200 feet offshore from the extreme low-water line", as is the case in the Interim Water Quality Control Plan. Instead there would be a prohibition of discharges into "any non-tidal water, lake, dead-end tidal slough or similar confined water area or their immediate tributaries," and also a prohibition of discharges "at any point at which the wastewater does not receive an initial dilution of at least 10:1." These prohibitions would only apply, however, to wastewaters having "particular characteristics of concern to beneficial uses." Even for those wastewaters, certain exceptions to the prohibition would be permitted.

3.9.3 State Bays and Estuaries Policy

The State Water Resources Control Board is in the process of preparing a "Water Quality Control Policy for the Enclosed Bays and Estuaries of California". The most recent draft of this policy is reproduced in Appendix C of this report. For the San Francisco Bay-Delta system, and particularly for the South Bay, the significant effects of adoption of this policy would be as follows:

- Bay or estuarine outfalls and diffusion systems would be required to "be designed to achieve the most rapid initial dilution and maximum dispersion as practicable to minimize concentrations of substances not removed by source control or treatment."
- Waste discharges into or adjacent to areas "where the protection of beneficial uses requires spacial separation from waste fields" would be prohibited.
- Chronic toxicity of wastewater discharges would be measured by a bioassay test. A formula is presented which relates the survival of test animals to the toxicity of the wastewater. A limit would be established for the concentration of toxicity in the Bay resulting from discharge of toxic wastewaters. Essentially, the policy would formalize and make definitive the general approach to the toxicity objective set forth in the Regional Board's Interim Plan.

3.9.4 Federal Objectives

Pursuant to the national goals and policies expressed in the Federal Water Pollution Control Act Amendments of 1972, the Environmental Protection Agency has adopted certain effluent limitations for discharges from publicly-owned wastewater treatment facilities, which have been determined to define "secondary treatment". These limitations may be summarized as follows:

- Biochemical oxygen demand (5-day) shall not exceed 30 mg/l as a monthly average and 45 mg/l as a weekly average.
- Suspended solids shall not exceed 30 mg/l as a monthly average and 45 mg/l as a weekly average.
- Fecal coliform bacteria density shall not exceed 200 MPN/100 ml as a monthly geometric mean and 400 MPN/100 ml as a weekly geometric mean.
- pH shall be within the range of 6.0-9.0.

Provisions are made for modification of these limitations under some circumstances, but under no conditions would BOD and suspended solids removals of less than 85 percent be tolerated.

It is the intent of the Clean Water Program that "secondary treatment" be effected nationwide by 1977. With completion of the secondary facilities at San Jose/Santa Clara, all plants in the study area will be in compliance with this Federal standard.

It is the expressed national goal that "best practicable treatment" by provided by 1983 for discharges from publicly-owned wastewater treatment facilities. A requirement for approval for grants under the Clean Water Program will be that any selected program anticipate provision of "best practicable treatment" for such wastewaters. At the present time, definition of "best practicable treatment" has not been adopted by the Environmental Protection Agency, nor have proposed regulations been circulated

for comment. It is understood that one set of effluent standards presently under consideration for discharges into navigable waters, conforming to "best practicable treatment," are as set forth in the following tabulation.

	Units of Measure	Monthly	Weekly
Ultimate Combined Oxygen Demand (UCOD)[a]	mg/l	50	75
Suspended Solids	mg/l	20	30
Chemical Oxygen Demand	mg/l	50	75
Fecal Coliform	MPN/100 ml	200	400
pH	units	(6.0-9.0)	

[a]UCOD = 1.5 (BOD_5) + 4.6 (NH_3 - N) - 1.0 (D.O.)

The practical effect of adoption of the above standards would be that ammonia removal (nitrification) would be required for all effluents discharged to navigable waters of the United States.

Under the Proposed Program and alternatives thereto involving discharge to the Bay (except for the "No Project" alternative), the maximum calculated concentration of ultimate oxygen demand in any effluent at the 1985 level is 53 mg/l, or slightly greater than the 50 mg/l in the draft standard cited above. Thus, if 50 mg/l were adopted as the Federal standard, a small amount of additional nitrification capacity would be needed under all alternatives in order to comply with "best practicable treatment." This would probably be provided at the Palo Alto plant.

Other significant goals and policies declared in the Federal Water Pollution Control Act Amendments of 1972 are the elimination of discharge of pollutants into navigable waters by 1985, and the prohibition of discharge of "toxic pollutants in toxic amounts." As of the present time, however, no specific rules or guidelines have been promulgated to implement these policies.

3.10 EVALUATION OF ALTERNATIVES

3.10.1 Introduction

The alternative programs for water quality management in South San Francisco Bay, described previously in this Section, have been evaluated from the standpoint of cost comparison, environmental impact, and other "intangible" considerations. The environmental impact of the Proposed Program, as well as of the viable alternatives thereto, is the principal subject of this report, and is addressed in detail in the ensuing sections. A number of other considerations, both quantifiable in dollar terms and in non-quantifiable or "intangible" terms, are of importance in the evaluation of the alternatives. These considerations are briefly analyzed below.

To the extent practical, a full analysis of the alternatives with respect to environmental and intangible considerations is set forth in Tables 3-3 through 3-6. The intent has been for those tables to be as complete and self-explanatory as possible. However, further explanation and amplification regarding some of the more important points has been found necessary. This is presented in the following paragraphs.

3.10.2 Compliance with Definitive Water Quality Objectives

The alternative programs have been evaluated with respect to their compliance with the various alternative water quality objectives described previously in this Section. For many factors, such as dissolved oxygen, pH, floating material, and coliform bacteria, objectives have been established which can be translated into specific planning criteria. For convenience herein, these are termed "definitive" objectives. Specific effluent limitations and discharge prohibitions would also fall into this category.

As shown in Table 3-3, the Proposed Program and Alternatives 1, 2 and 5 would comply with all of the definitive objectives set forth in the Regional Board's Interim Plan Water Quality Objectives, now in effect. Alternatives 3 and 4 would not include treatment for removal of oxygen demand sufficient to meet the objective of 80 percent of saturation for the level of median annual dissolved oxygen at all points in the South Bay, stated in the Interim Plan. This would meet or exceed the 5.0 mg/l minimum objectives. These alternatives would also not comply with the prohibitions of discharge within 200 feet of the extreme low water line. Alternative 6 (No Project) would fail to meet most of the Interim Plan's definitive objectives.

The effect of adoption of the definitive objectives set forth in the proposed Basin Plan Water Quality Objectives is shown in Table 3-4. For practical purposes, the Proposed Program and all alternatives thereto excluding the "No Project" alternative, would comply with these definitive objectives. The only exceptions would be:

- Alternative 2 apparently could not meet the limitation of 0.025 mg/l on un-ionized ammonia in the receiving water.
- Alternatives 3 and 4 may not be able to meet the 5.0 mg/l minimum dissolved oxygen concentration for Artesian Slough, even with the treatment postulated. If not, a short pipeline could be provided to convey effluents to Coyote Creek for disposal. Such a pipeline has not, however, been included in the preliminary cost estimates for these alternatives.
- Compliance of Alternatives 3 and 4 with the prohibition of discharge of wastewater having "characteristics of concern to beneficial uses" into dead-end tidal sloughs would be dependent on reliable removal of toxicants through source control and/or treatment. Also, it would require a decision that discharge of biostimulants to these waters is not of "concern."

The specific discharge limitations and prohibitions listed in the proposed State "Bays and Estuaries" policy are addressed in Table 3-4. These

relate to dilution of discharges, and spatial separation of discharges from sensitive areas (see paragraph 3.9.2). With regard to these:

- The Proposed Program and Alternatives 1 and 2 would comply; Alternative 2 would provide less initial dilution.
- Alternatives 3 and 4 would provide essentially no initial dilution of discharges; therefore compliance would be dependent on the adequacy of source control and treatment in removing "substances" (see Appendix C).

3.10.3 Compliance with Non-Definitive Water Quality Objectives

The principal "non-definitive" objectives of concern in evaluation of alternative water pollution control programs are biostimulants and toxicity. As mentioned previously, the Regional Board's Interim Plan does not contain objectives for those that are subject to definitive interpretation for use in planning studies. The proposed Basin Plan Objectives and the State's draft "Bays and Estuaries Policy" both suggest procedures for quantifying toxicity, but the procedures differ greatly.

A general discussion of these objectives with reference to alternative water pollution control programs follow.

Biostimulation. Levels of discharge of biostimulants to San Francisco Bay south of Dumbarton Bridge in the past have been substantially greater than those which would be expected to produce algal blooms. This suggests that some other substance or factor is responsible for limiting algal growths, because algae have not been significant problem in the main body of the South Bay, although nuisance blooms occur in Guadalupe Slough, Artesian Slough, and Coyote Creek.

Recently-obtained data indicate that a significant increase in algal populations occurred in the lower South Bay, over the ten-year period from 1961 to 1971. Although sufficient nutrients were available in the early

1960's in this area, phytoplankton levels remained low. Algal growth may be constrained by growth-inhibiting substances, reduced light penetration or an unfavorable biological environment. The gradual improvement in the general level of water quality in the lower South Bay as a result of improved wastewater treatment processes may have produced conditions more favorable to algal growth in recent years.

The identity of the substances or factors limiting algal growth is uncertain, and whether or not it will continue to be limiting in the future cannot be predicted with confidence. It is because of the uncertainty involved in continued discharge of treated effluents to the shallow portions of the South Bay that the Regional Board established in its Interim Plan the intention to adopt the prohibition of discharge to areas of limited tidal exchange, such as South San Francisco Bay, of wastewaters which have not had substantially all toxicants and biostimulants removed. As stated in Section 2, this prohibition has not as yet been invoked.

Removal of biostimulants in the treatment process is not proposed for any of the alternative water pollution control programs examined herein. Under all alternatives, the concentrations of nitrogen and phosphorous in the effluent streams in the future will be essentially the same as at present. Hence, control of nutrient concentrations in the receiving waters will be entirely dependent on the degree of effluent dilution afforded.

The Proposed Program and Alternative 1 will guarantee a reduction in the concentration of undesirable substances in the wastewater released south of Dumbarton Bridge, compared to present levels, at least through 1985. This is shown in Table 3-4. Under these alternatives, the amount of actual wastewater in the main channel of the South Bay in 1985 will be only about 90 percent of present levels. The maximum proportion of wastewater is calculated as 14 percent of total water volume, at any point in the area.

As can be seen from Table 3-4, all other alternatives (except ocean discharge) will result in increases in the amount of wastewater released to the Bay, south of Dumbarton Bridge, over present levels. Alternative 5 (ocean discharge) would eliminate treatment plant discharge of biostimulants to the South Bay.

Toxicity. The approach to measurement of chronic toxicity suggested in the proposed Basin Plan Water Quality Objectives is believed to be rational and well-founded, and is in fact the approach recommended by the Environmental Protection Agency. However, application of the procedure requires data on the concentrations of individual toxicants in the receiving waters and in the various wastewater streams. The allowable concentration of individual toxicants in the receiving water should be that value which will not cause a deleterious effect on the members of the biological community. Unfortunately, sufficient data of this type are not available at the present time in the South Bay to permit evaluation of the alternative water pollution control programs against the proposed objective.

An evaluation of the alternatives with reference to the toxicity requirements of the proposed "Bays and Estuaries Policy" is shown in Table 3-4. In the present draft of the policy, reproduced in Appendix C, no allowance is permitted for degradation of non-conservative components of total toxicity. Under these circumstances, as shown in Table 3-4, Alternatives 3 and 4 would not be able to comply with the proposed objective. The Proposed Program and Alternatives 1 and 2 would appear to comply. However, the numbers shown in Table 3-4 were estimated on the basis of typical concentrations of ammonia and MBAS toxicity only. If significant other toxicants exist in the actual wastewater streams, the final receiving water toxicity concentrations could be higher than the values shown in the table. As a conclusion, this objective, if adopted, would be the most difficult of all to comply with for all alternative programs except for Alternative 5 (ocean discharge).

In an earlier draft of the proposed policy, provision was made in the toxicity objective to assume a degree of degradation of non-conservative toxicants (defined as those "rapidly rendered harmless in the receiving water"). Because this earlier draft objective may yet be adopted, the alternative programs were evaluated against it also. As shown in Table 3-4, this objective would have considerably less effect on the alternatives, and would probably not present a problem in compliance.

As a general conclusion, it may be stated that there are many unknowns regarding toxicity of wastewaters and the effects thereof, as is the case with biostimulants. For many known toxicants, removal in standard wastewater treatment processes is limited, and satisfactory control is dependent on elimination at the source, if that source can be identified. Adequate dilution of effluent streams offers the best means of protection against the uncertainties of toxicant source control and/or removal by treatment.

In this regard, the Proposal Program and Alternative 1 will provide the greatest improvement in toxicity of South Bay waters, of all alternatives contemplating discharge to the Bay. Alternative 2 offers improved dilution over present conditions, but less than under the Proposed Program. Alternatives 3 and 4 are entirely dependent on treatment and source control for meeting toxicity objectives.

Alternative 5 (ocean discharge) would maximize improvement of Bay waters with respect to toxicity.

3.10.4 Impact on Shellfish Harvesting

Mention should be made of the anticipated effect of discharge of South Bay wastewaters, at a disposal point north of Dumbarton Bridge, on the shellfish beds in San Mateo County between Dumbarton Bridge and the Bay

Bridge. The State Department of Public Health presently prohibits harvesting of shellfish from these beds for human consumption. Shellfish, in their feeding process, are able to retain and greatly concentrate contaminants including pathogenic agents in overlying waters. Consequently, shellfish growing waters need to be of a high quality at all times and without exception.

In the recently completed sub-regional water quality management study for San Mateo County (2), mathematical model analyses were made to estimate the percentage of sewage in the Bay water body that could be anticipated at the Foster City shellfish beds at the various alternative locations for discharge of treated sewage effluents from San Mateo County. These studies assumed that under all alternatives, the South Bay Dischargers Authority's Proposed Program would be operational, with the discharge at the proposed point of disposal off Ravenswood Point, and with the quantities of such sewage effluent integrated into the studies with those of other dischargers south of the Bay Bridge. The modelling studies indicated that the percentage of sewage at the Foster City beds would range from 1.25 percent to 2.0 percent for the various San Mateo County discharge alternatives, under present flow conditions. The San Mateo County sub-regional report concluded that it would be possible to meet bacteriological requirements for shellfish harvesting with the proposed discharges.

This conclusion was essentially supported by the State Department of Public Health in a memorandum to the Executive Officer of the San Francisco Bay Regional Water Quality Control Board. That memorandum noted that, while the anticipated degree of dilution of wastewater and the proposed separation of San Mateo County waste discharges from the growing beds would not be satisfactory if dependence for protection of the sanitary conditions of shellfish growing waters were to be based on dilution and distance alone, they "should be adequate to provide necessary

health protection when accompanied by effective, reliable sewage treatment for all wastewaters." The memorandum emphasized the need for reliable operation of all wastewater treatment facilities, including existence of a system for notification of a regulatory authority in the event of an unexpected plant breakdown.

It can be concluded that discharge of wastewaters under the Proposed Program would not have an adverse impact on the bacteriological quality of shellfish harvesting waters north of Dumbarton Bridge. Alternatives discharging south of the Bridge could be expected to have an even lesser impact.

Export of the wastewaters for ocean disposal would provide positive, assured protection of the shellfish beds with respect to municipal dischargers. However, discharge of municipal wastewater effluents from treatment plants is only one source of pollutants in the waters of San Francisco Bay. Other important sources include urban area surface drainage (unregulated), and direct discharge from vessels in the Bay. The former, in particular, is a significant source of pollutants during the winter rainfall months. Thus, the effect of unregulated surface runoff in the vicinity of the beds might be such as to preclude shellfish harvesting for human consumption even with ocean disposal of domestic effluents, at least during the winter runoff season.

3.10.5 Reliability

Reliability of performance of a water pollution control system, in meeting water quality objectives, can be of great importance. Where discharges are to be receiving waters that are shallow or confined, the impact of even occasional system upsets may be significant.

The Proposed Program and Alternative 1 are deemed to be the most reliable of all alternatives involving discharge to the Bay, because discharge

would be to an area having a relatively great tidal interchange. This area would be quite insensitive to short-term variations in the characteristics of effluents. Alternative 1 may be slightly more reliable than the Proposed Program because fewer plants would be involved in operations.

The reliability of Alternative 5 for discharge to the ocean would be comparable to or better than that of the Proposed Program. Treatment processes would be simple, and discharge would be to an area relatively insensitive to loading variations.

Alternative 2 would be somewhat less reliable than the Proposed Program in meeting Bay water quality objectives, because discharge would be to areas more sensitive to loading variations.

Under Alternatives 3 and 4, effluent discharge from the San Jose/Santa Clara plant would be directly to Artesian Slough. With good operation, the freshwater-associated habitats of this area would be enhanced over present conditions. Under Alternative 4, the removal of the fresh-water flow from Guadalupe Slough could result in changes in salinity gradients and associated habitat changes. These changes are not expected to be significant in that there is no existing fresh-water dominated system in the slough at present. As a corollary, however, sporadic upsets in the treatment process could cause even more damage than if no such enhancement were provided originally. Unfortunately, the reliability of performance of advanced treatment process of the size and type postulated under these alternatives has not yet been demonstrated.

3.10.6 Flexibility

It is impossible to foretell with certainty what future requirements may be established for maintenance or improvement of the quality of the waters of San Francisco Bay. While local wastewater management agencies in years past have expended considerable effort to maintain a satisfactory

environment in the Bay, those agencies now find themselves, in general, unable to meet recently promulgated long-range water quality objectives and requirements of the State and Federal governments. In implementing programs to comply with these new objectives, it is of paramount importance that flexibility be retained to accommodate future, more stringent, water quality objectives and discharge requirements with a minimum loss of investment.

As noted in Table 3-3, the Proposed Program and Alternative 1 are very flexible in terms of meeting changed water quality objectives. Additional treatment processes can be added if necessary, at each or any treatment plant. Alternatively, the outfall pipeline can be extended to a more northerly disposal point or to the ocean, with little loss in sunk investment.

Alternative 2 is less flexible in regards to the outfall facilities. Extension of the outfall northward would require a location in the bottom of the Bay itself. This would not be as desirable as an on-land location from the standpoint of maintenance, ability to repair damage such as may be caused by seismic forces, cost of construction, or acceptability to regulatory agencies. The capability to be extended would have to be designed into the "first-phase" facilities initially.

To the extent that they rely exclusively on treatment, Alternatives 3 and 4 may be considered more flexible than the Proposed Program or Alternatives 1 and 2. Treatment facilities are more readily staged, to keep capacity close to demand growth, than are pipelines. In terms of ability to meet more stringent water quality objectives, however, little could be added to the initial treatment facilities to further reduce oxygen-demanding substances or toxicants in the effluent. An outfall to deep water would be required if these facilities prove inadequate.

Alternative 5 would rely on improved treatment to accommodate changing water quality objectives for the ocean. No flexibility exists in the outfall facilities regarding discharge location.

3.10.7 Acceptability

A preliminary evaluation of acceptability of the various programs has been made in Table 3-3. These have been based largely on the extensive meetings held during preparation of the South Bay Report, and on reactions to information published in that report. Further evaluations will be made following response to this draft environmental impact report.

General considerations bearing on "acceptability" are

- Local pressure to remove effluent discharges from the shallow waters of South Bay (Alternatives 2, 3 and 4)
- Questionable acceptability of ocean discharge concept to State and Federal authorities and to San Mateo County interests (Alternative 5)
- Achievement of regionalization and improved "cost-effectiveness" through abandonment of Sunnyvale treatment plant (Alternatives 1 and 3)

As stated previously, the City of Sunnyvale is strongly opposed to the concept of abandonment of the Sunnyvale plant.

3.10.8 Comparative Costs

Estimates of future capital and operating costs for the alternative programs, shown in Table 3-3, have been made based on the most recent available data for the various program elements. Primary sources of data include the draft project reports currently under preparation for the proposed treatment plant improvements at San Jose/Santa Clara and Sunnyvale, and for the proposed joint outfall pipeline.

All costs are estimated at the 1976 level of wages and prices, and capital cost estimates include appropriate allowances for right-of-way acquisition, final engineering, and owner's administrative costs. Future capital and operating costs have been projected to the year 2000 for each of the alternative programs, and discounted to present worth values in 1976 using a discount rate of 7 percent. Cost data shown in Table 3-3 include future operation and maintenance costs of existing facilities.

To indicate the relative cost impact of the various alternative programs on the individual citizens served thereby, the approximate per capita total cost of each alternative has been estimated for conditions with and without State and Federal grant funding under the Clean Water Program. To do this, the present worth of capital costs were expressed as annual equivalent values and added to the projected operation and maintenance costs in the year 1990. This total was divided by the projected population served in the year 1990 to obtain per capita costs. In one case, it was assumed that 75 percent of all capital costs would be funded by the State and Federal governments; in the other case, it was assumed that all costs would be borne by the local agencies.

3.10.9 Conformance with Regionalization Concept

In the past, a fundamental philosophy of State and Federal agencies has been to encourage regionalization of wastewater management facilities. Regionalization of wastewater treatment and disposal generally produces economies of scale in both capital and operating costs of treatment facilities, and usually results in more reliable and effective operations. Benefits of regionalization must, however, be weighed against the costs of achieving it and the desire of local entities to continue operation of their individual facilities.

A great deal of "regionalization" already exists in the area served by the Proposed Program. In recent years, the Cities of Mountain View and

Los Altos have discontinued their treatment plants and have gone to the Palo Alto plant for service. That plant also serves the communities of Los Altos Hills and East Palo Alto, as well as the Stanford University complex. The San Jose/Santa Clara plant serves those two cities jointly, as well as several outlying sewer districts. The City of Milpitas will abandon its treatment plant in the near future and go to San Jose/Santa Clara for service.

The remaining question is the extent to which further regionalization should be achieved, through consolidation of Sunnyvale with San Jose/Santa Clara and construction of a joint (regional) outfall facility.

3.10.10 Adaptability to Reclamation and Reuse Programs

As previously stated in this section, an important factor in evaluating alternative programs for water quality management in South San Francisco Bay is the degree to which facilities are adaptable to future reclamation and reuse of wastewater. Potential areas of major reuse now under study include groundwater recharge in Santa Clara County, and export to the Central Valley for augmentation of Delta outflows or for agricultural irrigation.

The Proposed Program and Alternative 1 would be adaptable to both local and regional reuse programs. If local reuse in the Santa Clara Valley is developed to the maximum potential extent, the effect would be to create "surplus" capacity in the joint outfall facility. However, that facility will be designed only for a 20-year growth in tributary population at the "E-Zero" growth rate. Substantial development of reclamation and reuse in the Valley will likely take ten to twenty years to implement anyway, so that the practical effect of such reuse would be to extend the useful life of the outfall pipeline.

Outfall facilities included in the Proposed Program and Alternative 1 would be entirely adaptable to integration into a regional reuse program, as described in sub-section 3.8.

Alternative 2 would be essentially the same as the Proposed Program and Alternative 1 in terms of "surplus" capacity in outfall facilities created by local reuse in Santa Clara Valley. However, the outfall facilities in this alternative would be much less compatible with the potential regional reuse programs.

Alternatives 3 and 4 would be most adaptable to reclamation and reuse, as compared with the other possible water pollution control programs. The treatment provided would meet most of the requirements for reuse in the Santa Clara Valley, assuming that the public health problems associated with such reuse can be resolved. Some degree of demineralization would have to be added to maintain the salt balance within the groundwater basin. The degree of treatment provided would probably be substantially more than necessary to render the effluent suitable for agricultural irrigation purposes under a regional reclamation program. Conveyance facilities may be needed for regional reclamation and reuse, depending on the program developed.

Of all potential programs, Alternative 5 would be the least compatible with future reclamation and reuse. Substantial further investments in treatment facilities would be required for any reuse, either locally or regionally. The entire conveyance system from Palo Alto to the ocean would be rendered unnecessary if any of the regional reclamation programs now under study were implemented.

3.10.11 Environmental Impacts

The alternative programs have been evaluated with respect to their long-term and short-term environmental impacts, as summarized in Tables 3-5 and 3-6. The detailed environmental analysis of the Proposed Program

and the viable alternatives thereto is the subject of the balance of this report.

The major factors that will determine which of the programs are best from an environmental standpoint are: water quality; bay and ocean ecology, terrestrial ecology, and aesthetic factors (odors and visual appearance).

As shown in Table 3-5, South Bay water quality is improved the most under Alternative 5 followed by the Proposed Program and Alternative 1.

The best recovery of the South Bay ecosystem is realized by the Proposed Program and Alternatives 1 and 5, while Alternatives 3 and 4 provide for the greatest enhancement of the fresh water-associated habitats in the tributaries of the South Bay (i.e. Artesian Slough). Alternative 2 results in a slight improvement in slough conditions and Alternative 6 offers no improvement.

The least effect on the terrestrial ecology is under Alternative 6, and the most effect under Alternative 5, the ocean discharge.

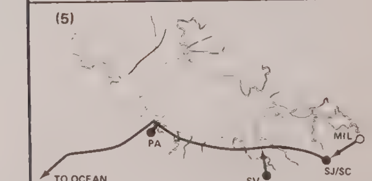
From the aesthetic standpoint (i.e., odors and visual appearance), abandonment of Sunnyvale's treatment plant, as under Alternatives 1 and 4, results in improved conditions for the planned regional park in Sunnyvale.

Table 3-3 SUMMARY EVALUATION OF ALTERNATIVES (BASED ON INTERIM WATER QUALITY OBJECTIVES).

FECT)		FLEXIBILITY TO MEET MORE STRINGENT WATER QUALITY OBJECTIVES	ACCEPTABILITY OF PROGRAM				COMPARATIVE COSTS *					CONFORMANCE WITH REGIONALIZATION CONCEPT	RESOURCE CONSERVATION	
E OBJECTIVES			Local	Regional	State	Federal EPA	Present Worth of Total Project Costs	Annual Equivalent Value of Capital Costs	Operation & Maintenance Costs Year 1990	Costs/Capita Year 1990			Adaptability to Reclamation and Reuse Programs	
ility of the System Comply with Quality Objectives	Improvement (Degree of Improvement of Bay Water Quality)									With Grants	Without Grants		In Santa Clara County	In a Regional System
proposed at Sunny- anticipated, removals n better than at San lara. However, Sunnyvale process established. Dis- of Dumbarton ensures in South Bay.	Will guarantee improvement south of Dumbarton Bridge by dilution alone. Some local degradation at outfall.	Very flexible in terms of meeting possible future changes in WQO, through upgraded treatment and source control for reduction of toxicants. If Bay water quality needs further improvement, system is flexible enough to extend outfall farther north in the Bay or to be added to an ocean discharge line.	Acceptable	San Mateo County may object to a pipeline containing Santa Clara wastewater discharging in the Bay in San Mateo County	Probably less favorable than (1) because of the additional treatment plant.	Probably less favorable than (1) because of the additional treatment plant.	$234.5 million	$23.5 million	$9.6 million	$11.60	$22.60	Good. Slightly less than (1).	Upgraded treatment facilities would be required at San Jose/ Santa Clara. Investments in "unused" capacity of the outfall facilities would be less than alternative (5) and more than for alternatives (2), (3), (4) and (6). Would not preclude reclamation opetion. Reclamation would extend useful life of outfall facilities.	Upgraded treatment facilities may be required. Most adaptable to regional reclamation and reuse system because of conveyance pipeline to Dumbarton Narrows. Could be extended to "aggregation point" at Alameda Creek with practically no loss of investment. Also, could become part of conveyance system to "aggregation point" at Alviso if outfall designed for two-way flow.
improvement over (P) system were not to ticipated; on the ould be less than (P) system works effectably. Discharge nbarton ensures im- South Bay.	Slightly greater than (P) because Sunnyvale plant discontinued.	Essentially same as (P)	Alternative not accepted locally by Sunnyvale.	Same as (P)	State probably in favor of regionalized project.	EPA probably in favor of regionalized project.	Cost data not available for draft report. Would be practically same as for Proposed Program.					Maximizes consolidation to the extent that is feasible and economical considering the existing plant investments. Under these conditions, achieves economy of scale and system reliability.	Same as (P)	Upgraded treatment facilities may be required. Adaptable to regional reclamation and reuse as in (P).
l uncertainties Discharge to duces reliability (P) and (1).	No improvement guaranteed for Bay south of Dumbarton Bridge. Does improve tidal sloughs now receiving discharge.	Less flexible than (P). Upgraded treatment and source control for reduction of toxicants can be provided, but large investments in the local facilities could be lost if more stringent WQO in future force export out of South Bay. Extension of outfall northward would require location in the Bay rather than on shore, which may not be desirable environmentally.	Possibly some objection by environmentalists and others because of the discharge of wastewater to the South Bay.	May not be accepted regionally since other agencies may be enjoined from similar type of discharges.	It is expected that State would not object.	EPA would probably not object.	$223.6 million	$21.3 million	$9.7 million	$11.45	$21.15	Minimum consolidation practical.	Upgraded treatment facilities would be required at San Jose/ Santa Clara. Would have less investment in "unused" capacity of outfall facilities than for (P) and alternatives (1) and (5).	Upgraded treatment facilities may be required. Less adaptable than (P) or (1). Much of local outfall facilities would have to be abandoned (specifically, all of Palo Alto outfall and portion of San Jose/Santa Clara outfall extending into Bay).
ncertainties listed unreliable with xicants and bio- Places maximum ncertainties of ol and treatment. , discharge to dead– ughs reduces reliability other alternatives.	No improvement guaranteed for Bay South of Dumbarton Bridge, or for tidal sloughs receiving discharge. But it is expected that some improvement will result due to increased treatment.	More flexible tha (P), (1), (2), or (5). Treatment plant improvements can be staged better than outfall pipeline. Outfall would be required if proposed treatment proves to be not adequate.	Probably will not be accepted environmentally unless absolute reliability of system to maintain a minimum D.O. of 5 mg/l and elimination of toxic effects in Artesian Slough and Coyote Creek can be demonstrated.	Same as (2)	State would probably not object if WQO's are met.	EPA would probably not object if WQO's are met.	$283.5 million	$29.2 million	$11.5 million	$14.60	$27.80	None	Some upgraded treatment facilities would be required at San Jose/Santa Clara, but less than for other alternatives. Very adaptable to a reclamation and reuse system since there is no investment in outfall facilities.	Upgraded treatment facilities may be required, but probably less than for other alternatives. Adaptable to a regional reclamation and reuse system, but conveyance facilities may be required.
to (1); discharge tidal sloughs oility.	Slightly greater than (3) because Sunnyvale plant discontinued.	Essentially same as (3).	Alternative not acceptable to Sunnyvale. See also comment in (3).	Same as (2)	Probably preferable to (3).	Probably preferable to (3).	Cost data not available for draft report. Would be practically same as for Alternative (3).					None	Essentially same as (3). San Jose/ Santa Clara flows already exceed potential market, hence flows from Sunnyvale not required to meet reuse demands	Same as (3).
ility of system to meet he same as (P)'s reliabil- he Bay WQO.	Considerable improvement in Bay water quality.	Changing ocean WQO can be met by only increasing treatment levels or with source control. System is not affected by changing Bay WQO.	Export of wastewater out of the South Bay is expected to be accepted environmentally.	San Mateo County and Half Moon Bay would probably object to a pipeline containing Santa Clara County wastewater discharging to ocean.	Uncertain whether State is in favor of ocean discharge.	Uncertain whether EPA is in favor of ocean discharge.	$241.1 million	$30.1 million	$6.7 million	$10.10	$25.10	Same as in (P).	Upgraded treatment facilities would be required at San Jose/ Santa Clara. Investments in "unused" capacity of the outfall facilities would be by far the greatest of the alternatives.	Upgraded treatment facilities may be required. Adaptable to regional reclamation and reuse systems as in (P), but substantial investment in conveyance facilities from Palo Alto to ocean would be lost.
	No improvement expected.	Most flexible of all alternatives to meet more stringent WQO since no investments are made in outfalls or treatment plant improvements that might be negated by changing WQO's.	Not acceptable since there is local pressure to improve the quality of the South Bay.	Not acceptable since there is expected to be regional pressure to improve the quality of the South Bay.	Not acceptable	Not acceptable.	$70.4 million	0	$5.7 million	$3.90	$3.90	None	Substantially upgraded treatment facilities would be required at San Jose/Santa Clara. Very adaptable to a reclamation and reuse system since there is no investment in outfall facilities.	Upgraded treatment facilities may be required. Adaptable to a regional reclamation and reuse system, but conveyance facilities would be required.

* All cost data are preliminary and subject to revision

Table 3-4 SUMMARY EVALUATION OF ALTERNATIVES AGAINST PROPOSED WATER QUALITY OBJECTIVES

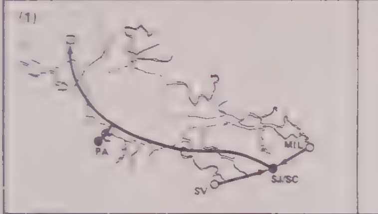
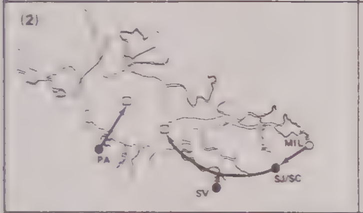
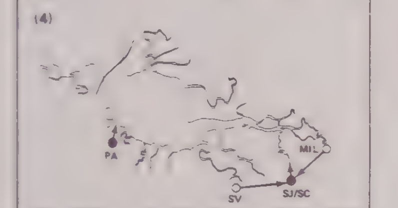
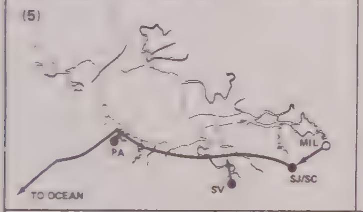
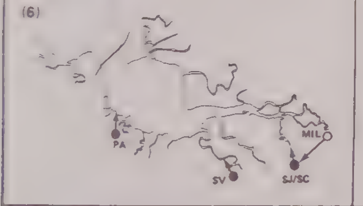
ILLUSTRATION OF PROJECT	CONFORMANCE WITH PROPOSED "BASIN PLAN" WATER QUALITY OBJECTIVES								CONFORMANCE WITH PROPOSED "BAYS AND ESTUARIES" POLICY			
LEGEND: → CONVEYANCE; □ DISCHARGE POINT. TREATMENT PLANTS: ○ RETIRED; ● IN-SERVICE	Major Definitive Objectives, Limitations, and Discharge Prohibitions					Significant Non-Definitive Objectives			Definitive		Non-Definitive (Toxicity)	
	Dissolved Oxygen	Coliform Bacteria	Ammonia	Acute Toxicity	Prohibitaion of Discharge to Dead-end Tidal Sloughs	Chronic Toxicity	Biostimulation [A]	Biostimulation [B]†	Discharge Dilution Capability	"Spatial Separation" Requirement	With Degradation	Without Degradation
(P) 	Meets "protection level B" objectives.	Complies	Complies	Complies	Complies	See note.*	14	90	Complies (8.5: 1 at 1985 flow rates)	Complies	Complies	Complies (31 ml/l in 1985)
(1) 	Meets "protection Level B" objectives	Complies	Complies	Complies	Complies	See note.*	14	90	Complies (8.5: 1 at 1985 flow rates)	Complies	Complies	Complies (31 ml/l in 1985)
(2) 	Meets "protection level B" objectives	Complies	Does not comply. Concentration about 120% too high.	Complies	Complies	See note.*	40	125	Complies (3:1 for San Jose/Santa Clara discharges, at 1985 flow rates)	Complies	Complies	Complies (36 ml/l in 1985)
(3) 	May not meet 5.0 mg/l minimum D.O. in Artesian and Guadalupe Sloughs. If not, limited effluent conveyance would be required to areas of greater assimulative capacity.	Complies	Complies	Complies	Complies, because effluents will not have "Particular characteristics of concern to beneficial uses", assuming source control and treatment are reliable and effective in removal of toxicants. Does not comply if nitrogen is determined to be a characteristic "of concern" in Artesian Slough, Guadalupe Slough, and Coyote Creek.	See note.*	50	130	May not comply if "source control and treatment" do not adequately remove toxicants. Essentially no initial dilution.	Probably complies	Probably Complies	Does not comply (46 ml/l in 1985)
(4) 	Same as (3), but would meet objectives in Guadalupe Slough.	Complies	Complies	Complies	Same as (3).	See note.*	55	130	Same as (3).	Same as (3).	Probably Complies	Does not comply (42 ml/l in 1985)
(5) 	Meets "protection level B" objectives.	Complies	Complies	Complies	Complies.	See note.*	2	5	N/A	Would comply	Would comply	Would comply
(6) 	Does not meet objectives.	Complies	Does not comply. Concentration about 350% too high.	Does not comply.	Does not comply.	See note .*	50	130	Does not comply.	May comply.	Probably does not comply.	Does not comply (165 ml/l in 1985)

Note * Not evaluated (see Text)

Note † [A] is maximum proportion of wastewater, as % of total water volume, in any part of the South Bay.
[B] is wastewater in main channel of South Bay in 1985, as % of present levels.

Table 3-5 SUMMARY EVALUATION OF ENVIRONMENTAL IMPACTS

LONG TERM IMPACTS

ILLUSTRATION OF PROJECT		Biological Environment		Physical/Chemical Environment		Aesthetic		Land Use		
LEGEND: → CONVEYANCE, DISCHARGE POINT; TREATMENT PLANTS: ○ RETIRED ● IN-SERVICE	Water Quality (Interim Plan)	Bay and Ocean Ecology	Terrestrial Ecology	Air Pollution Resulting from Project	Noise resulting from Project	Odors	Visual	Local Growth	Regional Growth	Air Pollution from People Resulting from the Project
(P) 	1. All definitive WQO's will be met. Improvements in D.O., coliform bacteria levels, etc. 2. Discharge of effluents north of Dumbarton will ensure improvement re toxicants and biostimulants in shallow extremities. 3. Discharge to relatively insensitive area expected to protect against loading variations. 4. Extreme southern tributaries (Artesian Sl., Guadalupe Sl., Coyote Creek) will revert to saline, tidal estuaries.	1. Uncontrolled urban runoff will present unrestricted shellfish harvesting. (effluent discharge would not prevent). 2. If "estuarine" outfall is selected, dredging may release toxicants in Bay muds, with potential adverse impact. 3. Substantial improvement in water quality will benefit Bay ecology. 4. Artesian Sl. will revert to saltwater-associated communities with reduction in biological diversity.	1. Vegetation along pipeline right-of-way will be controlled, decreasing the available habitat for the associated wildlife.	1. The sludge incinerators at the Palo Alto and San Jose/Santa Clara plants are expected to contribute a slight amount of air pollutants (NO_x, CO, particulate matter, and hydrocarbons) to the air basin. 2. Emissions from stationary power sources at the treatment plants. 3. Local air pollution impact is greater at Palo Alto and Sunnyvale since these plants are adjacent to planned regional parks.	1. Treatment plant equipment such as engines, turbines, pumps, etc. generate noise. 2. Palo Alto and Sunnyvale plants are adjacent to planned regional parks.	1. Some objectionable odors will result from the basic biological processes at Palo Alto, Sunnyvale, and San Jose/Santa Clara. Odors from Sunnyvale and Palo Alto are more critical than from San Jose/Santa Clara since the plants are adjacent to planned regional parks 2. Additional objectionable odors are expected to result from the oxidation ponds at Sunnyvale.	1. The visual impact of the Palo Alto and Sunnyvale treatment plant is substantial since these plants are located adjacent to planned regional parks, while the visual impact of the San Jose/Santa Clara plant is expected to be minimal. 2. The cleared rights-of-way are expected to have a visual impact since the type of vegetation that can be planted in this area is limited.	1. Population growth in Palo Alto and Sunnyvale is expected to be independent of the project. 2. Population growth in San Jose/Santa Clara is dependent on the project (i.e., project would permit continued growth).	Regional growth is independent of the project.	The change in air quality from the year 1973 to 2000 is expected to be independant of the project.
(1) 	Essentially same as (P), but with more reliability in complying with WQO's due to discontinuation of Sunnyvale treatment plant.	1. Similar to (P) 2. Existing biological environment in Guadalupe Sl. appears healthy and diverse. Hence, improvement in water quality due to discontinuation of Sunnyvale plant operations may not be reflected in improved habitats in Guadalupe Slough.	1. Increased impact as compared (P) because of the Sunnyvale to San Jose conveyance pipeline. Effect is expected to be minimal.	1. Slight increase over (P1), (i.e., Sunnyvale waste is conveyed to San Jose/Santa Clara). 2. Similar to (2), that is Sunnyvale's decrease could be balanced by the increase at San Jose/ Santa Clara. 3. As in (P-3), but Sunnyvale impact is eliminated.	1. Same as (P) except slightly less operational noise due to abandonment of Sunnyvale plant.	1. Less than (P) since this alternative eliminates the treatment plant at Sunnyvale.	1. Less than (P1) since this alternative eliminates the treatment plant at Sunnyvale. 2. Similar to (P2)		Same as (P)	Same as (P)
(2) 	1. All definitive WQO's will be met as in (P). 2. Less positive improvement re toxicants and biostimulants in southern limit of Bay. 3. Extreme southern tributaries will revert to saline, tidal estuaries as in (P).	1. Essentially same as (P). 2. Except, potentially greater hazard due to higher toxicant levels in Bay South of Dumbarton Bridge.	1. As in (P), except less dislocation because of reduced length of right-of-way.	Similar to (P)	Similar to (P)	Similar to (P)	Similar to (P). Less impact from cleared rights-of-way.	Same as (P)	Same as (P)	Same as (P)
(3) 	1. Will probably maintain D.O. in South Bay at 5.0 mg/l minimum, but will not achieve median D.O. = 80% of saturation. 2. Discharge to extremely sensitive areas, hence magnified impacts will result from loading variations. 3. Control of toxicants and biostimulants will depend entirely on treatment operations and source control. 4. Extreme southern tributaries will develop freshwater-associated environment.	1. As in (P-1). 2. No dredging impact. 3. Water quality in main body of South Bay will be somewhat improved, but D.O. levels will probably not support diverse or extensive marine biota. 4. Greatly improved water quality in southern tributaries (esp. Artesian Sl.) will enhance freshwater-associated habitats. However, this will be contingent on reliable and effective control of toxicants, at the source and/or at the treatment plants.	1. Terrestrial Vegetation will be reduced because of additional treatment plant facilities. 2. Otherwise effects are minimal.	1. Similar to (P) 2. Additional treatment facilities will include the use of carbon columns, which could release pollutants to the atmosphere. 3. With the large usuage of carbon it is expected that carbon regeneration will be practiced, thus increasing air pollution.	Similar to (P)	Similar to (P)	1. As in (P-1) except increased impact due to additional treatment facilities (i.e., carbon columns). 2. No impact from pipeline rights-of-way.	Same as (P)	Same as (P)	Same as (P)
(4) 	Essentially same as (3), except improved water quality in Guadalupe Slough will be achieved by discontinuation of Sunnyvale plant.	Similar to (3). See also comments in (1-2) re impact on Guadalupe Sl.	1. As in (3-1) but for San Jose/Santa Clara only. 2. As in (1-1). 3. Otherwise, effects are minimal.	1. Similar to (1) 2. Similar to (3-2) and (3-3).	Similar to (1)	Similar to (1)	1. As in (1-1) except increased impact due to additional treatment facilities (i.e., carbon columns). 2. Similar to (P-2).	Same as (P)	Same as (P)	Same as (P)
(5) 	1. Removal of wastewater discharges to the South Bay from South Bay communities improves water quality to the fullest. However, municipal discharges from those communities is only one of the pollution sources to the Bay (others are storm runoff, and other Bayside municipal dischargers). 2. All WQO's will be met, both definitive and non-definitive. 3. Otherwise similar to (P-3) and (P-4).	1. As in (P-1). Even complete removal of municipal discharges to Bay would not permit unrestricted shellfish harvesting at present time. 2. No dredging impact in Bay. Dredging in ocean would have minimal impact. 3. Greatest improvement in Bay Water quality and hence in Bay environment. Minimal detrimental impact on ocean environment. 4. Artesian Sl. will revert to saltwater-associated communities with reduction in biological diversity.	1. As in (P) except increased impact due to conveyance from Palo Alto to Half Moon Bay, the majority of which is a tunnel.	Similar to (P)	Similar to (P)	Similar to (P)	Similar to (P). Greater impact from cleared rights-of-way.	Same as (P)	Same as (P)	Same as (P)
(6) 	1. WQO's will not be met. Dissolved oxygen in South Bay and Southern tributaries will remain at lower levels. 2. Increasing discharge rates in the future will worsen already-unacceptable conditions.	1. As in (P-1). 2. No dredging impact. 3. Continued degradation of water quality in South Bay and southern tributaries would severely limit viable Bay environment. 4. Artesian Sl. freshwater-associated environment would continue as a fresh water-influenced habitat with low diversity.	1. No effect	Similar to (P), except that no future expansion would be involved, thus release of air pollutants is expected to be less than (P1).	Similar to (P)	Similar to (P)	1. Similar to (P). 2. No impact from pipeline rights-of-way.	With no project, it is expected that a building ban would occur, thus a short-term retardation of population growth.	Same as (P)	Same as (P)

SHORT TERM IMPACTS

Project		Biological Environment		Physical/Chemical Environment		Aesthetic	
	Water Quality	Bay and Ocean Ecology	Terrestrial Ecology	Air Pollution Resulting from Project	Noise Resulting from Project	Odors	Visual
(P)	1. Turbidity increase during dredging is aesthetically displeasing, reduces light penetration, flocculates planktonic algae, and decreases availability of food. 2. Dredging can result in oxygen depletion followed by release of noxious materials. Extent of impact is a function of the pipeline route, which to date has not been selected.	Vegetation and animals along the pipeline R.O.W. in the marsh areas, salt ponds, mud flats, and deep water areas could be eliminated or displaced as a result of digging for the pipeline trenches. The extent of the impact is a function of the pipeline route, which to date has not been selected.	1. Vegetation and wildlife will be eliminated or displaced as the result of digging the pipeline trenches. The extent of the impact is a function of the pipe-route, which to date has not been selected. 2. Minimal impact is expected due to treatment plant expansion.	1. Excavation for the pipeline trenches will result in localized air pollution from equipment. 2. Air pollution impact will also result from exhaust emissions from construction equipment and the vehicles involved in material transport. 3. Plant expansions will also have impacts as stated in items 1 and 2. 4. The extent of the impacts in items 1 and 2 is a function of the pipeline route, which to date has not been selected.	1. Disturbs wild life, which feed and breed in the salt ponds, marshes and other areas, as a result of construction equipment, and vehicles involved in material transport. 2. Minimal impact anticipated on people, as project area is removed from residential areas.	1. Trenching can result in oxygen depletion followed by release of objectionable materials such as methane and sulfides. 2. Odors can result from exhaust emissions from construction equipment and the vehicles involved in materials transport.	1. Construction equipment can be aesthetically displeasing. 2. Construction activities – grading, stockpiling of materials, can be aesthetically displeasing by removing visually atractive lands from use.
(1)			1. Similar to (P) except an increased impact because of Sunnyvale to San Jose/Santa Clara conveyance pipeline and the demolition of the Sunnyvale treatment plant.	Similar to (P) except there is increased air pollution due to the construction of the Sunnyvale to San Jose conveyance pipeline and the demolition of the Sunnyvale treatment plant.	As in (P) except there is increased noise due to the construciton of the Sunnyvale to San Jose conveyance pipeline and the demolition of the Sunnyvale treatment plant.	Similar to (P)	As in (P) except there is an increased visual impact associated with the construction of the Sunnyvale to San Jose conveyance pipeline and the demolition of the Sunnyvale treatment plant.
(2)	Similar to (P)	Similar to (P)	Similar to (P)	Generally less than (P) because excavation is primarily in the off-shore area.	Similar to (P) except the noise is expected to affect people less since construction is primarily in the off-shore area.	Similar to (P)	As in (P)
(3)	No effect	No effect	1. Higher level of treatment will require additional facilities and may result in the elimination or displacement of some vegetation and wildlife. Impact is expected to be minimal.	Similar to (P-3)	Similar to (P-2)	Similar to (P-2)	1. Similar to (P-1) 2. Similar to (P-2)
(4)	No effect	No effect	Increased impact over (3) because of the Sunnyvale to San Jose/Santa Clara conveyance pipeline and the demolition of the Sunnyvale treatment plant.	1. Similar to (P-3) 2. Increased air pollution over (3) due to the construction of the Sunnyvale to San Jose conveyance pipeline and the demolition of the Sunnyvale treatment plant.	1. Similar to (P-2) 2. Increased noise over (3) due to the construction of the Sunnyvale to San Jose conveyance pipeline and the demolition of the Sunnyvale treatment plant.	As in (3) except an increased impact due to the construction of the Sunnyvale to San Jose conveyance pipeline and the demolition of the Sunnyvale treatment plant.	1. Similar to (P) 2. Increased visual impact over (3) due to the construction of the Sunnyvale to San Jose conveyance pipeline and the demolition of the Sunnyvale treatment plant.
(5)	1. No dredging impact on the Bay since the conveyance system is expected to be on land. 2. Dredging impact on the ocean similar to (P) except that the impacts per mile from toxicants are expected to be less.	Similar to (P) but with dredging impacts in ocean.	1. As in (P) except increased impact due to conveyance from Palo Alto to Half Moon Bay, the majority of which is in a tunnel. Non-tunnel portion will result in the elimination or displacement of vegetation and wildlife. 2. Otherwise similar to (P)	As in (P) except there is an increased impact because of the added interceptor/outfall length.	1. As in (P) except there is an increased impact because of the added interceptor/outfall length.	Less than (P) since there is no dredging in the Bay, and dredging in the Ocean is expected to release less noxious materials.	As in (P)
(6)	No effect	No effect	No effect	No effect	No effect	No effect	No effect

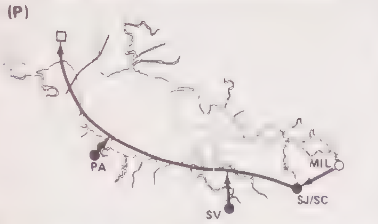
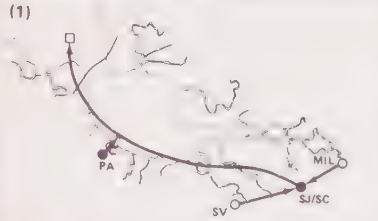
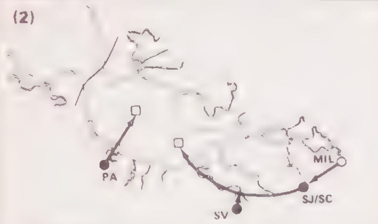
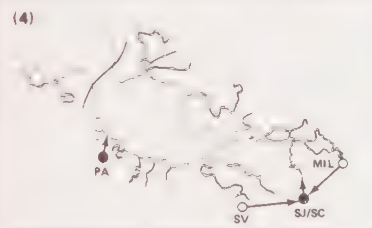
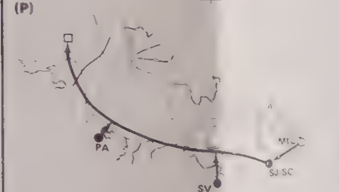
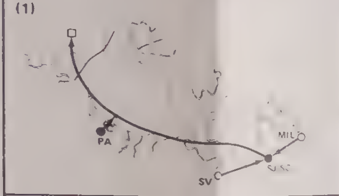
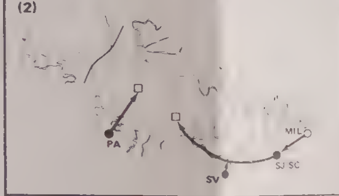
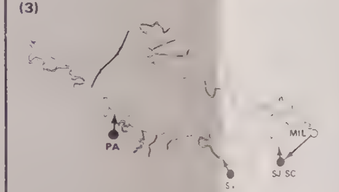
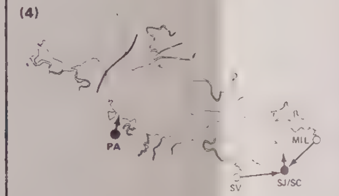
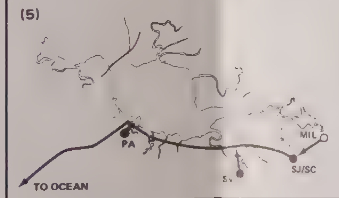
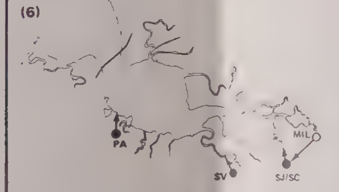
ILLUSTRATION OF PROJECT				
LEGEND → CONVEYANCE □ DISCHARGE POINT TREATMENT PLANTS ○ RETIRED ● IN-SERVICE	ical Environment		Aesthetic	
		Noise Resulting from Project	Odors	Visual
(P) 	1. All definitive Wult in D.O., coliforr 2. Discharge of effhaust will ensure impthe biostimulants in 3. Discharge to reluted to protect again 4. Extreme southe a Guadalupe Sl., to saline, tidal e	1. Disturbs wild life, which feed and breed in the salt ponds, marshes and other areas, as a result of construction equipment, and vehicles involved in material transport. 2. Minimal impact anticipated on people, as project area is removed from residential areas.	1. Trenching can result in oxygen depletion followed by release of objectionable materials such as methane and sulfides. 2. Odors can result from exhaust emissions from construction equipment and the vehicles involved in materials transport.	1. Construction equipment can be aesthetically displeasing. 2. Construction activities — grading, stockpiling of materials, can be aesthetically displeasing by removing visually atractive lands from use.
(1) 	Essentially samellution reliability in cor to discontinuatition treatment plant,	As in (P) except there is increased noise due to the construciton of the Sunnyvale to San Jose conveyance pipeline and the demolition of the Sunnyvale treatment plant.	Similar to (P)	As in (P) except there is an increased visual impact associated with the construction of the Sunnyvale to San Jose conveyance pipeline and the demolition of the Sunnyvale treatment plant.
(2) 	1. All definitive W as in (P). 2. Less positive im toxicants and bi southern limit o 3. Extreme souther revert to saline, as in (P).	Similar to (P) except the noise is expected to affect people less since construction is primarily in the off-shore area.	Similar to (P)	As in (P)
(3) 	1. Will probably m mg/l minimum, = 80% of satura 2. Discharge to ex fied impacts wi 3. Control of toxi entirely on trea 4. Extreme southe freshwater-asso	Similar to (P-2)	Similar to (P-2)	1. Similar to (P-1) 2. Similar to (P-2)
(4) 	Essentially same water quality instruc- be achieved by e pipe- Sunnyvale planatment	1. Similar to (P-2) 2. Increased noise over (3) due to the construction of the Sunnyvale to San Jose conveyance pipeline and the demolition of the Sunnyvale treatment plant.	As in (3) except an increased impact due to the construction of the Sunnyvale to San Jose conveyance pipeline and the demolition of the Sunnyvale treatment plant.	1. Similar to (P) 2. Increased visual impact over (3) due to the construction of the Sunnyvale to San Jose conveyance pipeline and the demolition of the Sunnyvale treatment plant.
(5) 	1. Removal of wasbecause from South Bay quality to the fu from those com sources to the B other Bayside m 2 All WQO's will b non-definitive. 3. Otherwise simila	1. As in (P) except there is an increased impact because of the added interceptor/outfall length.	Less than (P) since there is no dredging in the Bay, and dredging in the Ocean is expected to release less noxious materials.	As in (P)
(6) 	1. WQO's will not in South Bay an will remain at lo 2. Increasing disch will worsen alre conditions.	No effect	No effect	No effect

Table 3-6 SUMMARY COMPARISON OF ALTERNATIVES

LEGEND: → CONVEYANCE; □ DISCHARGE POINT. TREATMENT PLANTS: ○ RETIRED; ● IN SERVICE

ILLUSTRATION OF PROJECT	DEFINITIVE WATER QUALITY OBJECTIVES (INTERIM PLAN)			NON-DEFINITIVE WATER QUALITY OBJECTIVES (INTERIM PLAN)			FLEXIBILITY TO MEET MORE STRINGENT WATER QUALITY OBJECTIVES	ACCEPTABILITY OF PROGRAM				CONFORMANCE WITH REGIONALIZATION CONCEPT	RESOURCE CONSERVATION: Adaptability to Reclamation and Reuse Programs		LONG TERM IMPACTS										SHORT TERM IMPACTS						
																Biological Environment		Physical/Chemical Environment: Resulting from Project		Aesthetic		Land Use				Biological Environment		Physical/Chemical Environment: Resulting from Project		Aesthetic	
	Compliance	Reliability	Enhancement	Compliance	Reliability	Enhancement		Local	Regional	State	Federal EPA		In Santa Clara County	In a Regional System	Water Quality	Bay and Ocean Ecology	Terrestrial Ecology	Air Pollution	Noise	Odors	Visual	Local Growth	Regional Growth	Air Pollution from People Resulting from Project	Water Quality	Bay and Ocean Ecology	Terrestrial Ecology	Air Pollution	Noise	Odors	Visual
(P) 	Good	Good	Good	Good	Good	Good	Good	Acceptable	Acceptable	Expected to be Acceptable	Expected to be Acceptable	Acceptable	Acceptable	Good	Slight	Insignificant	Insignificant	Slight	Insignificant	Moderate	Moderate	Slight	No effect	Unknown	Slight	Moderate	Moderate	Slight —	Slight —	Slight	Moderate
(1) 	Good	Good +	Good	Good	Good +	Good	Good	Unacceptable	Acceptable	Expected to be Acceptable +	Expected to be Acceptable +	Acceptable +	Acceptable	Good	Slight	Insignificant	Insignificant	Slight	Insignificant	Slight	Slight	Slight	No effect	Unknown	Slight	Moderate	Moderate +	Slight	Slight	Slight	Moderate
(2) 	Good	Acceptable	Poor	Acceptable	Poor	Acceptable	Acceptable	Acceptable	Poor	Acceptable	Acceptable	Poor	Acceptable +	Poor	Moderate	Moderate	Insignificant	Slight	Insignificant	Moderate	Moderate	Slight	No effect	Unknown	Slight	Moderate	Moderate	Slight	Slight	Slight	Moderate
(3) 	Unacceptable	Poor	Poor	Poor	Poor	Poor	Good	Poor	Poor	Acceptable	Acceptable	Unacceptable	Good	Acceptable	Moderate	Insignificant -None	Insignificant	Slight	Insignificant	Moderate	Moderate	Slight	No effect	Unknown	None	None	Moderate	Slight —	Slight —	Slight	Moderate
(4) 	Unacceptable	Poor	Poor	Poor	Poor	Poor	Good	Unacceptable	Poor	Acceptable	Acceptable	Poor	Good	Acceptable	Moderate	Insignificant -None	Insignificant	Slight	Insignificant	Slight	Slight	Slight	No effect	Unknown	None	None	Moderate +	Slight	Slight	Slight	Moderate
(5) 	Excellent (In Bay) Good (In Ocean)	Excellent (In Bay) Good (In Ocean)	Excellent (In Bay) Good (In Ocean)	Excellent	Good (for Bay)	Good (for Bay)	Acceptable	Acceptable	Poor	Acceptable	Unknown	Acceptable	Poor	Poor	None (in Bay) Insignificant (in Ocean)	Insignificant (on Ocean) None (on Bay)	Slight	Slight	Insignificant	Moderate	Moderate	Slight	No effect	Unknown	None (on Bay) Moderate (on Ocean)	Moderate	Moderate +	Slight	Slight	Slight	Moderate
(6) 	Unacceptable	N/A	Unacceptable	Unacceptable	N/A	Unacceptable	Good	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Unacceptable	Good	Acceptable	Severe	Severe	None	Slight	Insignificant	Moderate	Moderate	Limiting	No effect	Unknown	None	None	None	None	None	None	None

RATING SCALE

Compliance, Reliability, Enhancement, Flexibility, Acceptability, Conformance, Reclamation	Excellent, Good, Acceptable, Poor, Unacceptable, Unknown
Water Quality, Biological Environment, Physical/Chemical Environment, Aesthetic	Severe, Moderate, Slight, Insignificant, None, Enhance
Land Use	Favorable, No Effect, Insignificant, Slight, Limiting, Adverse, Unknown

part II

Proposed Program

part II

Proposed Program

Section 4 Environmental Setting of the Proposed Program

Section 4

ENVIRONMENTAL SETTING* OF THE PROPOSED PROGRAM

4.1 LOCATION

San Francisco Bay is located in the central coastal section of the Coast Range Province, which is delineated by a series of north-northwest trending mountain ranges and intermountain valleys and is bounded on the east by the Central Valley and on the west by the Pacific Ocean. The Bay lies in a north-trending depression bounded on the west by low hills of the San Francisco and Marin Peninsulas and on the east by a low plain gently sloping up to the base of the northwest trending Berkeley Hills.

The Proposed Program was described in Section 2, and is shown schematically in Figure 4-1. The area to be served by the Proposed Program encompasses most of Santa Clara and a portion of San Mateo Counties on the southern portion of San Francisco Bay (Figure 4-2). The member cities of South Bay Dischargers Authority, together with respective tributary agencies include:

- City of Palo Alto
  - Los Altos
  - Los Altos Hills
  - Mountain View
  - East Palo Alto Sanitary District
  - Stanford University
  - Barron Park
  - Moffett Field

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*Note: A more extensive description of the environmental setting is presented in Section 16.

- Las Encinas Sanitary District

- City of Sunnyvale
- Cities of San Jose and Santa Clara
  - Burbank Sanitary District
  - Cupertino Sanitary District
  - Sunol Sanitary District
  - County Sanitation District No. 2
  - County Sanitation District No. 3
  - County Sanitation District No. 4
  - Campbell Sanitary District
  - Los Gatos Sanitary District
  - Monte Sereno Sanitary District
  - Saratoga Sanitary District
- Milpitas Sanitary District (to be incorporated into San Jose/Santa Clara)

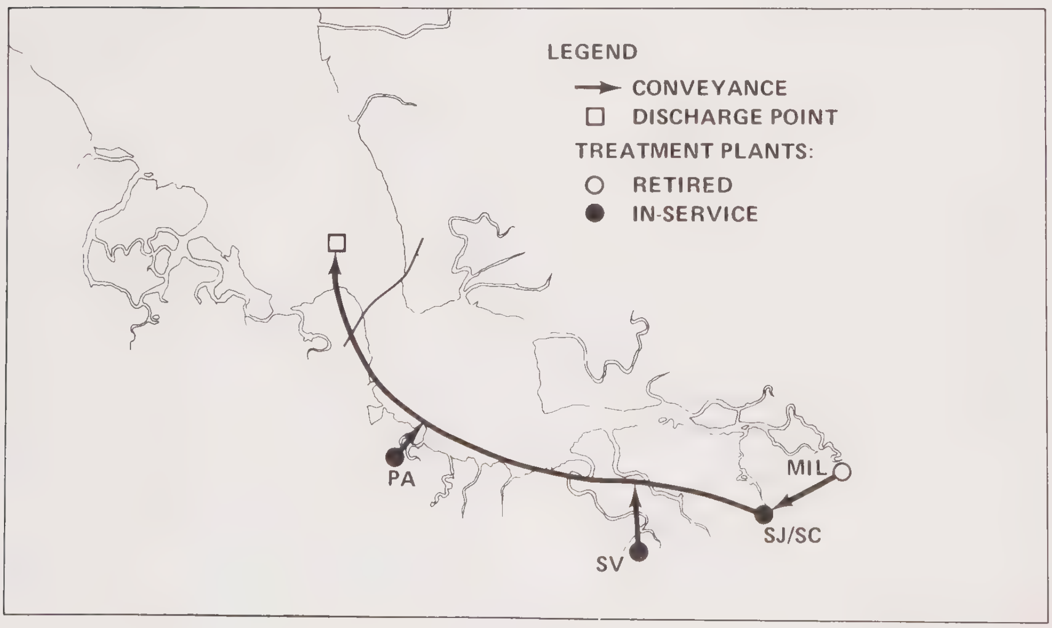
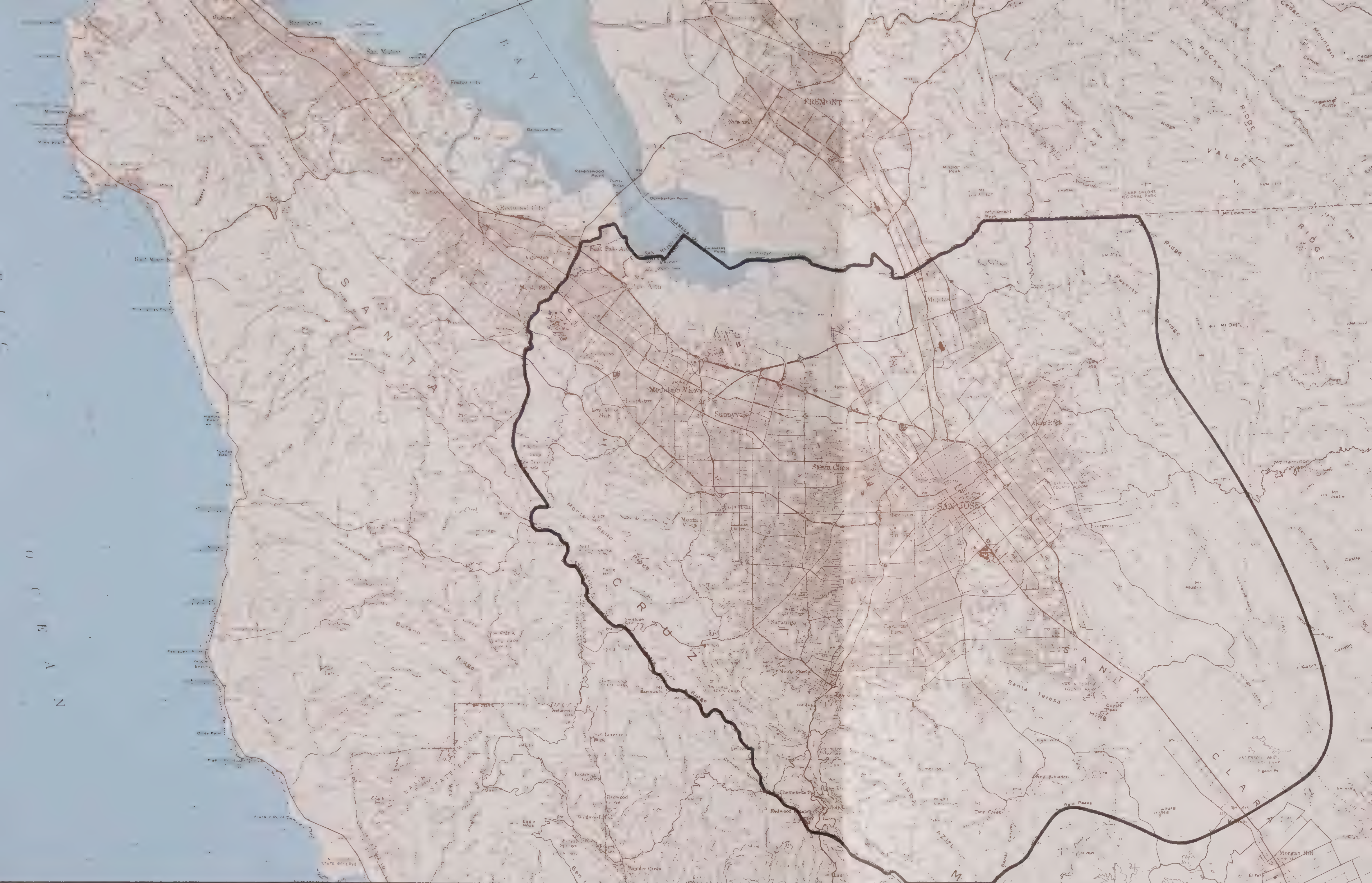


Figure 4-1. The Proposed Program



LEGEND:

PROGRAM AREA BOUNDARY

Figure 4-2
AREA TO BE SERVED
BY THE PROPOSED PROGRAM

The program area is primarily in the Baylands of Santa Clara County, which comprise the sloughs, marshes and lowlands at the northerly end of the Santa Clara Valley and the southerly end of San Francisco Bay.

4.2 EXISTING WATER POLLUTION CONTROL FACILITIES

The San Jose/Santa Clara treatment plant is an activated sludge plant with average dry weather flow during the 1970 non-cannery season of 72 mgd (Figure 4-3), and 96 mgd during the canning season. The average daily load of oxygen demanding material (UOD) was about 100,000 pounds per day (Figure 4-4). The effluent is presently discharged to Artesian Slough, which flows into Coyote Creek and thence into San Francisco Bay.

The Sunnyvale treatment plant is a secondary facility with sedimentation tanks and oxidation ponds. The 1970 average dry weather flow without cannery wastes was 14.4 mgd, and the UOD was about 20,000 pounds per day. During the canning season the flow rate increases by 9 mgd. The effluent is presently discharged to Guadalupe Slough.

The Palo Alto treatment plant is an activated sludge plant with an average dry weather flow of 22.1 mgd, and the UOD was about 50,000 pounds per day. The effluent is presently being discharged to an unnamed mud flat channel about 1500 feet out into the Bay, north of Palo Alto airport.

The Milpitas treatment plant system includes two small plants: a 3.8 mgd activated sludge plant; and, a 0.7 mgd trickling filter plant. The present dry weather flow rate is 2.8 mgd, and the UOD was about 3,000 pounds per day. The effluent from these plants discharges into Coyote Creek.

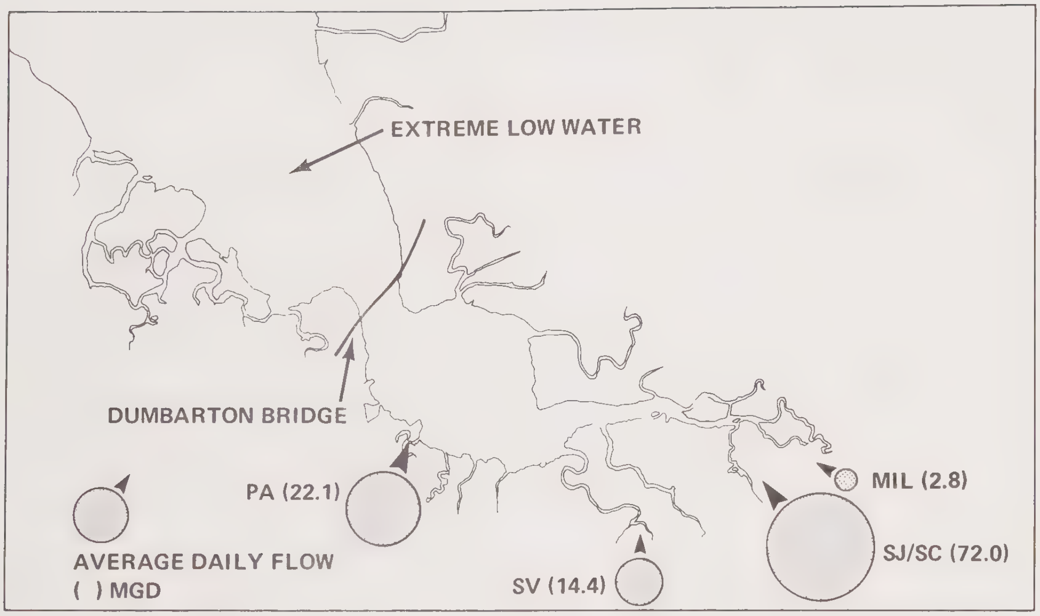


Figure 4-3. Discharge of Treated Wastewater by Members of the South Bay Dischargers Authority, 1970

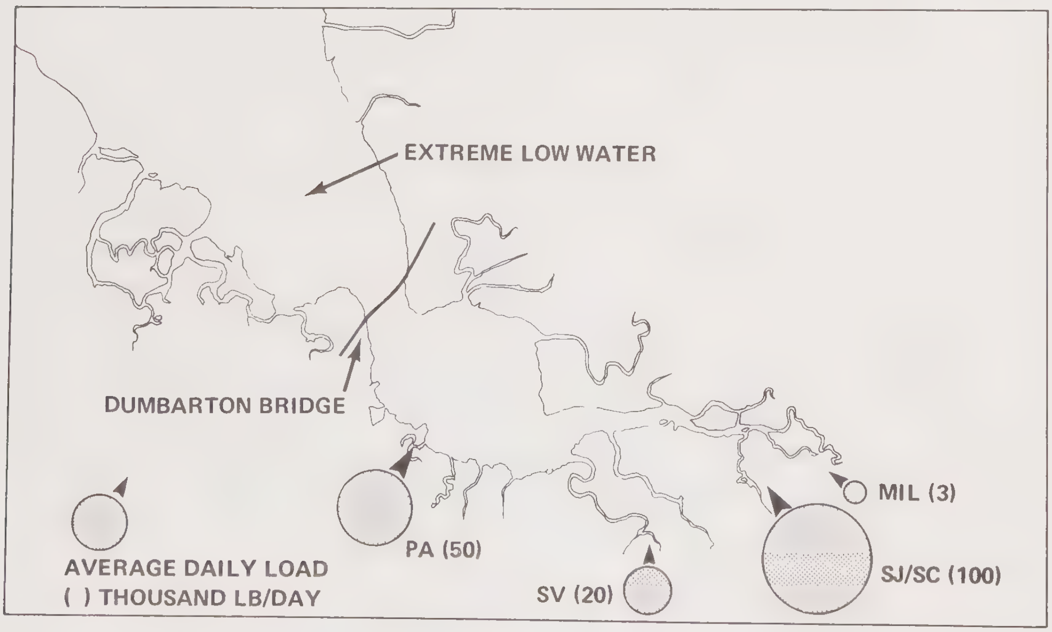


Figure 4-4. Discharge of Ultimate Oxygen Demand by Members of the South Bay Dischargers Authority, 1970

4.3 EXISTING AND PLANNED PUBLIC AND PRIVATE DEVELOPMENTS

The Sunnyvale and Palo Alto wastewater treatment plants are adjacent to future Baylands park areas, while the San Jose/Santa Clara plant is in a less sensitive area. The conveyance pipeline, however, may pass through highly sensitive Baylands areas. It is therefore necessary to identify these areas and the existing and planned public and private facilities in the Baylands (Figure 4-5 and 4-6) that may be impacted by the Proposed Program. These areas have been identified as follows:

1. Moseley's Duck Club
2. Peninsula Sportsman's Club
3. Cooleys' Landing
4. Laumeister Tract
5. Faber Tract
6. Palo Alto Golf Course
7. Palo Alto Municipal Airport
8. Palo Alto Yacht Club
9. Sand Point
10. ITT Tract
11. Hooks' Island
12. Santa Clara County Flood Retention Basin
13. Charleston Slough
14. Sunnyvale Park
15. Mountain View Shoreline Park
16. Ames Research Laboratory
17. Moffett Field
18. Sunnyvale Oxidation Ponds
19. Knapps' Duck Club
20. New Chicago Marsh (section of Alviso unit and San Francisco Bay wildlife Refuge.)
21. Section of the Greco Island unit of the San Francisco Bay Wildlife Refuge in the vicinity of Ravenswood Point.

The above areas include grasslands, salt ponds, salt marshes, sloughs, mud flats, and open water areas. Thus, the variation in habitats is extensive (Figure 4-7) and includes some wildlife species on the endangered list (Figure 4-8). Detailed information on these developments is set forth in Section 16.

4.4 GEOLOGY

The major structural features of the Bay area are the San Andreas and Hayward Fault Zones (Figure 4-9). Both are seismically active. In addition, there are possible fault features in the bedrock (600-2400 feet) beneath the Baylands that are roughly parallel to and between the San Andreas and Hayward Fault Zones. In the event of a future large earthquake on the San Andreas or Hayward faults, there is the possibility that sympathetic movement might occur on such parallel faults lying below the Baylands. Further, the Baylands soils are subject to the threat of liquefaction or lateral spreading. Both of these conditions create a potential for damage to the conveyance pipeline.

4.5 AIR QUALITY

The mean monthly temperatures for the Santa Clara area range from 48° to 68°F. The mean monthly rainfall ranges from a trace to 2.87 inches, with a yearly total of 14 inches (4). The yearly ranges for pollutants in the San Jose area, which is somewhat typical of the project area, are: oxidants, 0.02-0.10 ppm; CO, 4-10 ppm; oxides of nitrogen, 0.08-0.31 ppm; and hydrocarbons, 4-8 ppm (4).

4.6 HYDROLOGY

There are five important sources of water in Santa Clara County: 1) local surface runoff; 2) groundwater; 3) raw (untreated) water imported through the South Bay Aqueduct; 4) water from the South Bay Aqueduct treated at the Riconada Water Treatment Plant; and, 5) water imported by the San Francisco Water Department.

4.7 BAY WATER QUALITY

The water quality in South San Francisco Bay, at present, is as follows: 1) DO levels approach zero in the sloughs and less than 1.0 mg/l in the main body of water; 2) nitrogen, phosphorus and dissolved silica levels

are in excess of concentrations capable of promoting undesirable algal blooms; 3) coliform concentrations are too high to permit shellfish harvesting, and water contact sports, such as swimming, in the South Bay; and 4) visible amounts of floating material (oil, grease, etc.) have been observed.

4.8 POPULATION

Population growth in Santa Clara County has been quite rapid since 1940. Santa Clara County had a low of 2.5 percent of the state population in 1940 and 5.4 percent of the state population in 1970. Compared to the San Francisco Bay area as a whole, Santa Clara County's population grew about 2.3 times as fast.

Continued growth in population in Santa Clara County indicates a continued growth in employment in areas other than agriculture, which is declining.

4.9 AESTHETICS, HISTORICAL, ARCHAEOLOGICAL FACTORS

Archaeological sites, paleontological and historical resources have been found throughout Santa Clara County. The history of the area indicates that the potential for uncovering these resources during a project involving excavation is quite good.

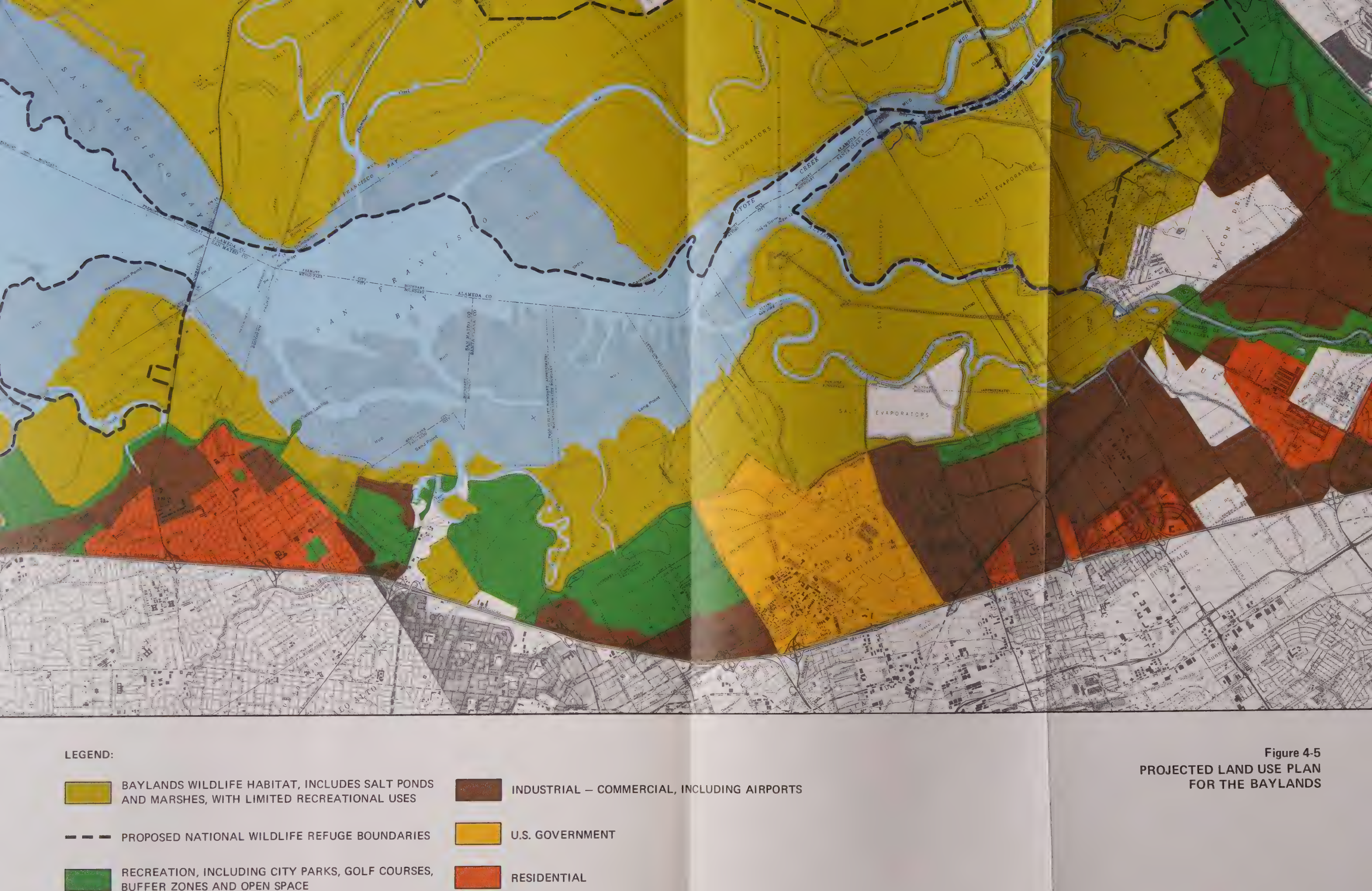
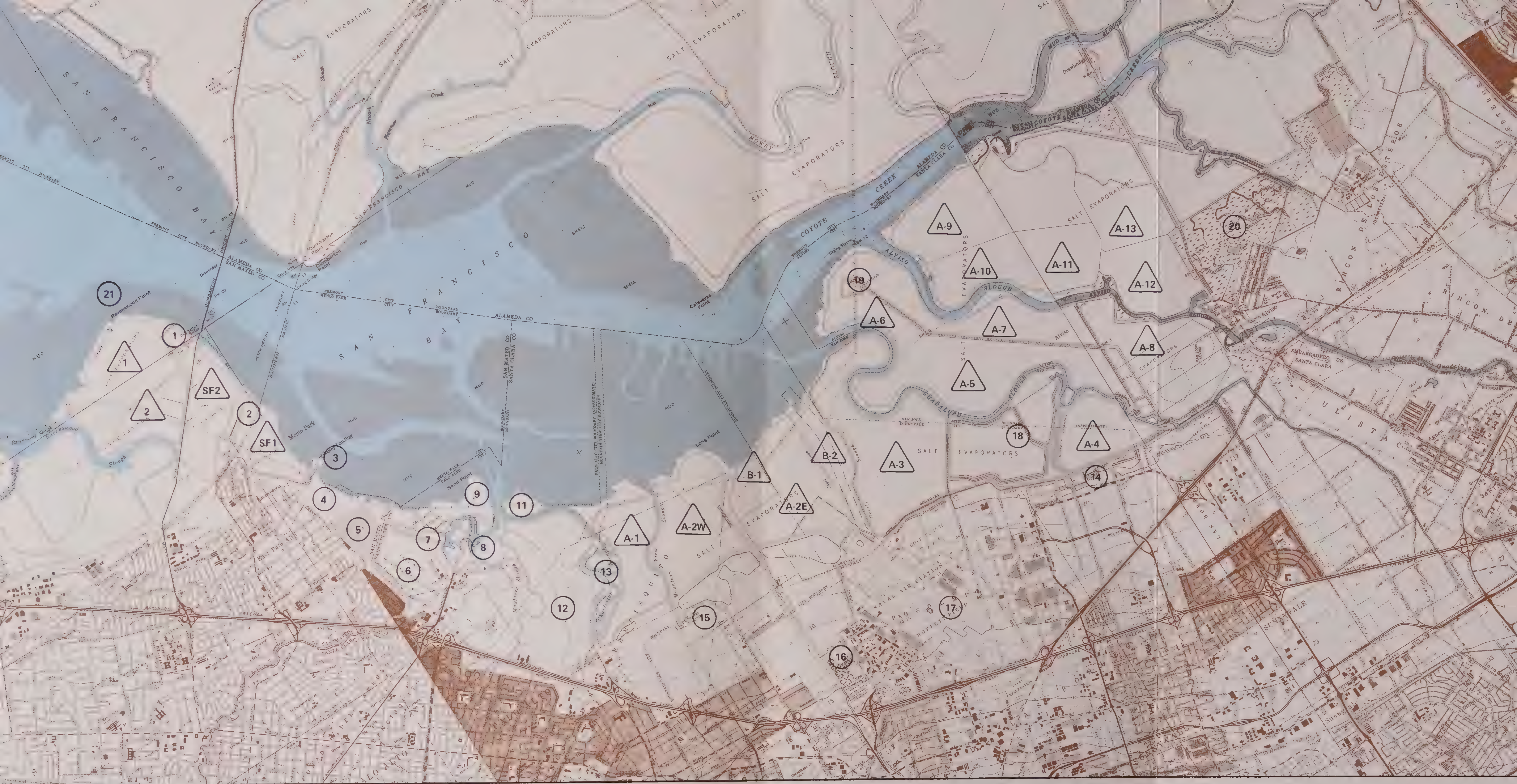


Figure 4-5
PROJECTED LAND USE PLAN FOR THE BAYLANDS



LEGEND:

LESLIE SALT COMPANY, SALT POND DESIGNATIONS

EXISTING FACILITIES

1 DUCK CLUB
2 PENNINSULA SPORTSMAN'S CLUB
3 COOLEY'S LANDING
4 LAUMEISTER TRACT
5 FABER TRACT
6 PALO ALTO MUNICIPAL GOLF COURSE
7 PALO ALTO AIRPORT
8 PALO ALTO YACHT HARBOR
9 SAND POINT
10 ITT TRACT
11 HOOK ISLAND
12 COUNTY FLOOD CONTROL BASIN
13 CHARLESTON SLOUGH MARSH
14 CITY OF SUNNYVALE SHORELINE PARK
15 MOUNTAIN VIEW SHORELINE PARK
16 AMES RESEARCH
17 MOFFETT NAVAL AIR STATION
18 SUNNYVALE OXIDATION POUNDS
19 DUCK CLUB (NATURE CONSERVANCY)
20 NEW CHICAGO MARSH (SECTION OF ALVISO UNIT OF SAN FRANCISCO BAY WILDLIFE REFUGE)
21 SECTION OF GRECO ISLAND UNIT OF THE SAN FRANCISCO BAY WILDLIFE REFUGE IN THE VICINITY OF RAVENSWOOD POINT

Figure 4-6

EXISTING AND PLANNED PUBLIC AND PRIVATE FACILITIES IN THE BAYLANDS

LEGEND:

ESTUARINE FLATS

OPEN TIDAL FLATS AND SLOUGH FLATS

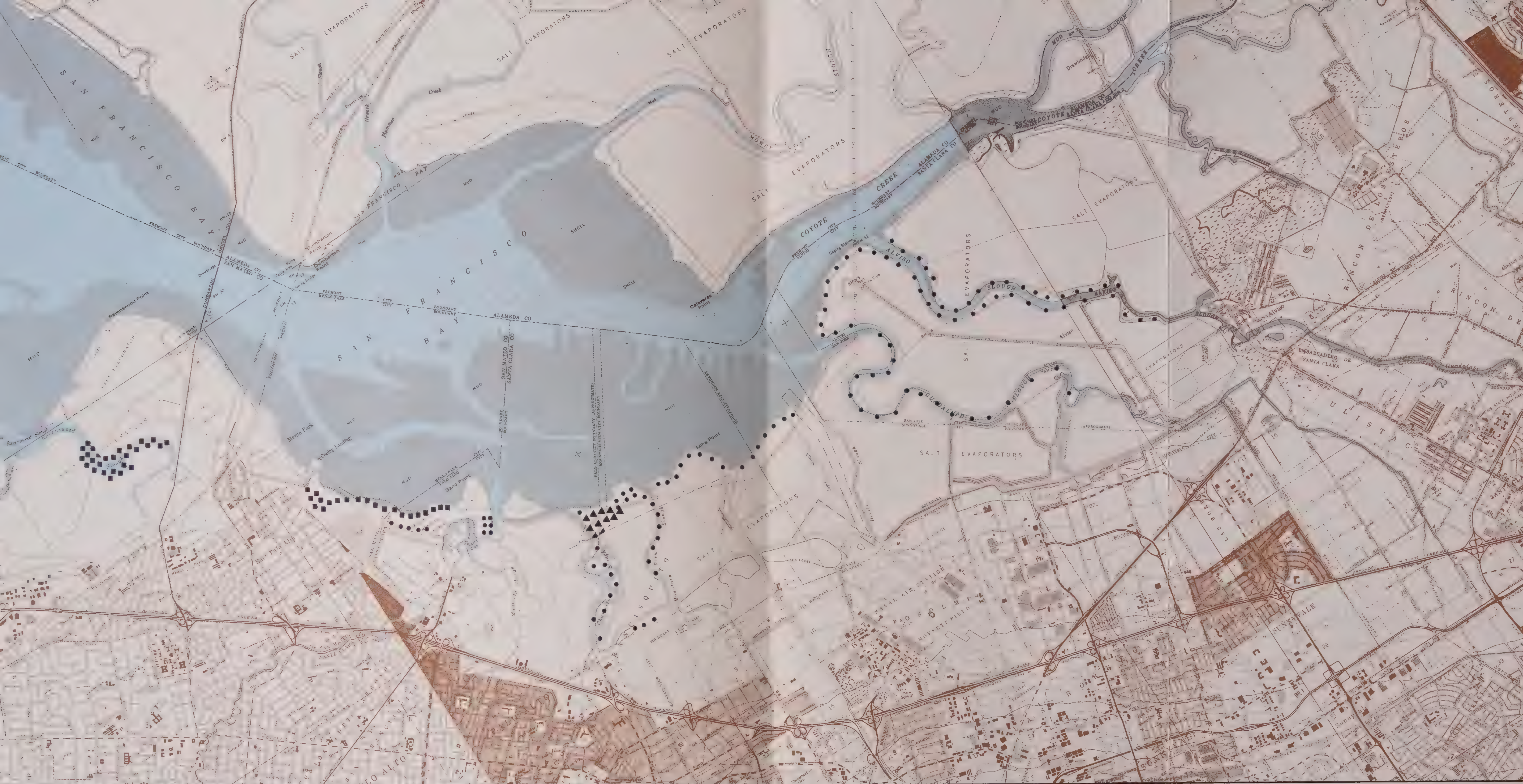
SALT PONDS

SALT MARSHES AND SLOUGH "EYEBROWS"

"UPLAND MEADOWS" AND "WET" GRASSLANDS

MANAGED MARSH, PRIMARILY FRESH WATER

Figure 4-7
HABITATS IN THE BAYLANDS



LEGEND:

- CALIFORNIA CLAPPER RAIL PRIMARY NESTING AREAS (MID MAY)
- CALIFORNIA CLAPPER RAIL SECONDARY NESTING AREAS (JUNE-JULY)
- CALIFORNIA LEAST TERN NESTING AREA (LATE APRIL-JULY)

SALT MARSH HARVEST MOUSE – PRESENT IN LOW NUMBERS THROUGHOUT THE BAYLANDS – ALL BAYLANDS MARSH IS POTENTIAL HABITAT.

Figure 4-8
ENDANGERED SPECIES
IN THE BAYLANDS

END:

CALIFORNIA CLAPPER RAIL PRIMARY NE
(MID MAY)

CALIFORNIA CLAPPER RAIL SECONDARY
(JUNE-JULY)

CALIFORNIA LEAST TERN NESTING AREA
(LATE APRIL-JULY)

T MARSH HARVEST MOUSE – PRESENT IN LOV
BAYLANDS – ALL BAYLANDS MARSH IS POTE

Figure 4-8
ENDANGERED SPECIES
IN THE BAYLANDS

LEGEND:

FAULT

APPROXIMATED

CONCEALED

Figure 4-9
ACTIVE EARTHQUAKE FAULT ZONES
IN THE PROGRAM AREA

part II

Proposed Program

Section 5 Environmental Impact of the Proposed Program

Section 5

ENVIRONMENTAL IMPACT OF THE PROPOSED PROGRAM

5.1 SUMMARY OF PROGRAM IMPACTS

Short-term impacts will be limited to the effects of the construction program as follows:

- Noise, dust, air pollution and increased construction traffic
- Removal of existing vegetation
- Displacement and/or alteration of the habitat for plants and animals
- Increased refuse disposal

Long-term impacts will be limited to the effects during the operation and maintenance phase of the program as follows:

- There may be some disruption of aquatic species from the release of the wastewater, a decrease in the dissolved oxygen concentration and an increase in turbidity in the vicinity of the discharge.
- Water quality modelling and other studies (1) have indicated that discharge of the treated wastewater at the proposed outfall point will have the impacts presented in Table 5-1.
- Other water quality modelling studies (2) have indicated that discharge of treated wastewater at the proposed outfall point will not have an adverse impact on the bacteriological quality of shellfish harvesting waters north of Dumbarton Bridge. Even with improved treatment of municipal effluents now contemplated by the

various agencies discharging to South San Francisco Bay, pollution of Bay water from unregulated urban runoff is such that unlimited harvesting of shellfish is considered unrealistic, at this time, by State Health Department officials.

Specific numerical values relating to the environmental impact of the proposed program have not been presented herein, since:

- The function of this document is to present an overview on the environmental aspects of the South Bay Dischargers Program.
- The information should be developed at a later date and be a part of the four project reports and project environmental impact reports.

Table 5-1

SUMMARY TABLE OF THE IMPACT OF DISCHARGING TREATED WASTEWATER AT THE PROPOSED OUTFALL POINT

WATER QUALITY

- Meets definitive water quality objectives by 1976 and thereafter
- Insures significant improvement to the Bay south of Dumbarton Bridge with respect to toxicants and biostimulants
- Satisfies prohibition of discharge within 200 feet offshore from extreme low water line
- Provides high degree of system reliability
- Protects beneficial uses of South Bay waters
- Provides recovery of the South Bay system from presently increasing pollutional loads

SOCIO-ECONOMIC

- The system is feasible under existing laws
- The system provides a method to establish an authority for administration, allocation of costs, construction facilities, and monitoring of effluent.
- The system has the flexibility:
    - To meet near-term objectives
    - To meet changes in population growth, technology and water quality objectives
    - To expand treatment plant capacity
    - To provide higher treatment levels
    - To extend outfall toward the central Bay
    - To convey wastewater to the ocean
    - To develop and participate in regional wastewater reclamation and reuse programs.

5.2 IMPACT OF WASTEWATER TREATMENT PLANTS

5.2.1 Short-Term Impact

The construction (short-term) impact of the wastewater treatment facilities will be limited to the upgrading of the facilities at San Jose/Santa Clara, Sunnyvale and Palo Alto. The impacts of the construction program are described in the following paragraphs.

Site clearing operations for the plant modifications will remove existing vegetation and alter the wildlife habitat and will displace resident animals. The noise associated with the construction activities will also contribute to the displacement of wildlife. The impact is short-term, existing only for the duration of construction, and for that period of time thereafter that the ecosystem needs to reach a new level of equilibrium. The impact on the ecosystem is usually not of prime importance or significance for this type of construction, as this area has already been committed to wastewater treatment plant use.

In addition to the site clearing operations, the construction associated with the treatment plants will create a temporary but disruptive impact. These activities include: construction of buildings and plant facilities, excavation, vehicular traffic, operation of construction equipment, and other related human activity. While this activity will be confined largely to the plant site and entry roadway, the noise, air pollutants, and traffic created will radiate out from the plant site.

Vehicular and pedestrian traffic will not be appreciably affected by construction activities and there will be no construction hazards in areas normally frequented by the public. Public access to the three treatment plant sites, which are removed from residential areas, will be controlled.

Air quality will be affected locally by construction activities since air pollutants such as dust, smoke and exhaust fumes are generated by earth moving operations and engine exhausts. Open burning is prohibited thus eliminating the potential pollutants from this source.

Noise is associated with normal construction practices. Again, because of the location of the treatment plants, the effect on people in residential areas will be virtually nonexistent. Blasting noises are not expected because soil conditions will not require the use of this technique. At Sunnyvale, there will be an added noise and biological impact from pile-driving for a bridge-supported pipe crossing from the southeastern extremity of Oxidation Pond No. 2 to the northernmost corner of the construction area. This activity will have a noise impact on the birds that normally frequent the nearby salt ponds, sloughs and the oxidation ponds. The pile driving activity is not expected to last more than one week.

Water quality can be affected by the construction of the wastewater treatment plants. If construction takes place during the rainy season (November through April), sites that have been cleared of vegetation can easily be eroded, resulting in an increased turbidity and suspended solids load to the Bay. Other construction operations use fresh water and thus increase the wastewater load. Some of these operations include: concrete batching, dust control, sanitation, fire protection, and erosion control. Equipment washwater also add to the wastewater load.

Water quality can also be affected if untreated or partially treated wastewater is bypassed during the construction phase. There will be no bypassing during the plant modifications, however.

Substantial quantities of earth must be disposed of during excavating operations. It is anticipated that the Mountain View park may be the point of disposal for some of the spoil material generated during construction.

Construction refuse generated during the upgrading of the three wastewater treatment plant facilities (which includes: concrete, lumber, metal, fuel, grease, oils, herbicides, insecticides, etc.) will have to be removed to landfill sites. Thus, construction refuse will have an impact on the overall landfill site capacity of the area.

It is expected that an adequate labor force is available in Santa Clara County, and importation of labor will not be necessary to handle the construction work for this project.

The wastewater treatment plant program involves expansion adjacent to existing sites. The conveyance pipeline will traverse some 16 miles of land and water area which include state marshlands, federal property (Moffet Field), state parks, recreational areas, and estuaries. None of these land uses will be permanently displaced or otherwise affected. The impact is temporary and will occur only during the construction period.

5.2.2 Long-Term Impact

On a long-term basis (operation), the particular geology of the Baylands presents foundation and structural problems that could result in seismic damage to the treatment plants. But, as the plants will be designed to the same structural earthquake standards as all other structures in the area, the risk is reduced substantially.

The lands used for the improvements to the three plants are lands adjacent to the existing plant sites, thus not changing land use patterns in the area will result. For both Sunnyvale and Palo Alto, uses of these lands will not interfere with the shoreline parks planned by these cities, though odors are expected in the park areas. Visual and open space elements of the plant sites will be permanently altered but without significant adverse aesthetic impact.

In all three cases, the natural or present character of the area will not be changed. Architectural procedures will be used to blend the treatment facilities with the area to lessen the aesthetic impact, to the extent that such is both financially and technically feasible. New structures will have less impact on visual aesthetics than the existing structures, and lighting will be controlled to lessen the impact to surrounding areas. The use of treatment processes different from those proposed would not materially reduce the visual impact on land area required for the structures.

Increased population growth could increase congestion, noise, urban sprawl, with a coincident increased demand for public services. However, the affected cities can regulate growth through judicious planning. Further, worker migration is somewhat dependent upon employment opportunities which are related to the available wastewater treatment facilities. Population growth may cause increased adverse impacts in the area. It is anticipated that this program will not have a direct effect on inducing population growth in the area, because no expansion of capacity is proposed at the San Jose/Santa Clara, Sunnyvale, or Palo Alto treatment plants.

Odors are normally associated with the biological treatment plants, but as the plants in the study area are some distance from residential areas the odors are not expected to objectionable. However, as the Palo Alto plant is adjacent to the Palo Alto yacht harbor, golf course, and municipal airport, a potential odor problem exists. Both the Sunnyvale and Palo Alto plants are adjacent to proposed shoreline parks, and a definite adverse impact on the people using the parks can be expected. However, the San Jose/Santa Clara plant is sufficiently far from residential areas and people-related activities as to obviate odor problems.

The incinerators at the Palo Alto treatment plant and those planned for the San Jose/Santa Clara treatment plant are expected to increase the concentration of air pollutants in the area, thus a direct adverse impact is expected. The extent of this impact is a function of the incinerator design, sludge composition, and the type of air pollution control equipment used.

The disposal of sewage sludge to a landfill site has technical problems associated with it, such as the water content and the loss of this land for other purposes, which results in a significant adverse impact. It is anticipated that if incinerators are used for sludge disposal instead, the overall adverse impact will be less.

Based on the mathematical water quality modelling studies (1) conducted for the South Bay Report, it was concluded that the treatment plant modifications currently being made, together with the proposed modifications and conveyance and discharge of the wastewaters from the South Bay dischargers north of Dumbarton Bridge, will result in the following impacts on the waters of South San Francisco Bay relative to present conditions:

- A decrease in oxygen depleting pollutants, coliform bacteria, floatable material, settleable material, odors, color, and turbidity.
- A decrease in toxic metals, ammonia and biostimulants.
- A decrease in the quantity of chlorine to the receiving body of water.
- A decrease in the amount of solids being conveyed to landfill sites.

Further discharges to this area will not violate water quality objectives of the Bay.

Mathematical water quality modelling studies, which included 12 separate combinations of discharges from San Mateo County, together with the corresponding discharges from the other South Bay, East Bay, and San Francisco subregions, were performed by Jenks and Adamson, consulting engineers, for San Mateo County (2). These studies lead to the conclusion that discharge of treated wastewater at the proposed outfall point will not have an adverse impact on the bacteriological quality of shellfish harvesting waters north of Dumbarton Bridge. Even with improved treatment of municipal effluents now contemplated by the various agencies discharging to the South Bay, pollution of Bay Waters from unregulated urban runoff is such that unlimited harvesting of shellfish is considered unrealistic, at this time, by State Health Department officials.

Groundwater supplies will not be significantly affected by the treatment plant operation, since plants of this type generally have an insignificant amount of leakage. However, as the three plants are in areas subject to flooding, untreated wastewater could conceivably reach the Bay. Raised treatment plant sites and/or levee protection would be necessary to reduce this risk.

Biological treatment plant noise is generally produced by pump engines, generators, gas engines (i.e., use of digester gas or natural gas as a power source for engines to generate power), and blowers. The noise level of such equipment is generally above 110 db at a distance of less than 50 feet, but the impact on people in surrounding areas is expected to be low since the buildings that house the equipment will have adequate acoustic insulation to reduce the noise levels to an acceptable level.

The air pollution level within these facilities will satisfy OSHA requirements for work-day exposure.

Public health and safety should not present a problem to residents and visitors to the area, since there will be controlled access to the treatment plants. Provisions will be made to eliminate the adverse impact of insects which may be attracted to the plant sites. If insecticides are necessary, only approved types will be used, and applied in conformance with local regulations.

5.3 IMPACT OF CONVEYANCE SYSTEM (INTERCEPTOR/OUTFALL)

5.3.1 Short-Term Impact

5.3.1.1 General Impacts. The alternative land and estuarine route systems shown in Figure 5-1 are currently under study.

The specific alignments indicated have been selected from among several alternatives, based on engineering, land acquisition and environmental considerations. Imput from various city and county agencies were used to minimize the amount of sensitive habitats crossed.

Construction of the proposed pipeline and various ancillary facilities will cause a variety of short-term environmental impacts during the estimated 36 months required for construction. Some impacts are common to the conveyance system and the treatment facilities. They are discussed in Section 5.2.

The major area of impact of the pipeline passing through urban land will be on commercial and recreational areas. Construction may require excavation for trenches near or under several streets. Traffic patterns would be disrupted during this period of excavation, contributing to an increase in traffic congestion.

Excavation of the open trench and deposition of backfill beside the trench could produce some dust problems, noise problems, and decrease the air quality. Further, air quality would be degraded locally by exhaust emissions from the construction equipment and the vehicles involved in material transport. These impacts would be localized and limited to construction periods.

5.3.1.2 Impacts on Natural Systems along the projected routes are as follows:

- San Jose/Santa Clara to Sunnyvale

Construction along the projected right-of-way from the San Jose/Santa Clara treatment plant to the Sunnyvale plant would be generally parallel to existing street and highway rights-of-way, and would have little biological impact (Figure 5-1).

- Sunnyvale to Palo Alto.

Downstream from Sunnyvale, two alternative alignments have been identified for the conveyance facility to the vicinity of the Palo Alto plant. One possible route (termed the "on land" route) follows inland dikes and existing rights-of-way. This alternative would pass through the Santa Clara Flood Control Basin between Mayfield and Charleston Sloughs, and through Casey Slough on the western edge of the planned Mountain View Shoreline Park along an alignment immediately adjacent to the existing 72-inch inside diameter force main from the old Los Altos treatment plant to the Palo Alto treatment plant (Figure 5-1). This area is primarily grassland. Construction activities would remove some plant species and cause wildlife to move to other, nearby grassland sites. Restoration of the right-of-way would permit subsequent reestablishment of wildlife species.

The other possible route (termed the "estuarine" route) passes through Salt Ponds A-3 and B-2, a stretch of highly productive estuarine flats and a portion of the deep channel in South San Francisco Bay. Major impacts on the flats could include the disruption of the benthic community which supports a significant wildlife feeding area. Little impact on biota would be expected in the deep channel due to the present impoverished conditions found there. Restoration of the flats and channel bottom would permit repopulation although a small portion of the flats would not support as much wildlife for the period of repopulation.

- Palo Alto to Discharge Point

Downstream from Palo Alto, there are three alternative alignments to the discharge point (Figure 5-1). One would involve continuation of the "estuarine" route along the navigation channel, and would require a connecting pipeline from the Palo Alto plant to the main pipeline. The route for this connecting line would be through the Palo Alto Yacht Harbor, thence across mudflats to join the main conveyance pipeline.

The second alternative would involve continuation of the main "on land" alternative under Option 1 (Figure 5-1). The alignment would follow the west bank of San Francisquito Creek, west of the levee, pass just to the east of the East Palo Alto urban area to the vicinity of the Southern Pacific Railroad, and then would turn into the navigation channel in the Bay near the railroad bridge. From this point, the line would proceed up the navigation channel to the discharge point. This alignment would involve some impact on salt marshes west of the San Francisquito Creek and Faber Tract levees and in the vicinity of the Southern Pacific Railroad - Hetch Hetchy Aqueduct corridor. Trenching and other activities would remove a portion of the vegetation in this marsh and displace the wildlife. Such disruptions would be temporary, and upon revegetation of the right-of-way, plant and animal life should reestablish in the area.

NOTE: LOCATIONS OF GROUNDWATER SAMPLING
STATIONS. SEE TABLE 16-2 FOR DATA

Figure 16-3
GROUNDWATER QUALITY
IN SANTA CLARA COUNTY

There would be some displacement of light industrial developments near Cooley Landing. The alignment is contiguous with that of the Embarcadero Road approach to the proposed new Dumbarton Bridge, and careful coordination would be required to minimize adverse impacts if the bridge project is approved.

A third alternative would involve continuation of the main "on land" alternative from the Palo Alto plant under Option 2, which would actually involve heading into the Bay (Figure 5-1). This alignment would pass through taxiways of the Palo Alto airport to the levee at the point of discharge of Palo Alto's existing outfall, then follow the existing Palo Alto outfall channel through the mudflats to the deep channel of Mayfield Slough (submerged), then out this channel to the main navigation channel near the Southern Pacific Railroad bridge, and up the navigation channel to the disposal point. Impacts on the deep channels would be as described previously. Impacts on a thin marshland strip on the outboard side of the airport levees could be considerable since this is the primary meeting place of the California clapper rail, an endangered species. Impacts on airport operations would be minimized by careful traffic control. Impacts on the mudflats would be minimal since the pipeline would be located in an existing man-made channel and these mudflats are less productive, due to tidal influence, than the nontidal flats in the southern reaches of the Bay. Impacts on small craft navigation in the Mayfield Slough channel would be minimal as the channel is several hundred feet in width along the proposed alignment.

5.3.1.3 Impact on Bay Water Quality. The dredging operation necessary for laying the pipeline in the Bay would have the following impact on water quality (5, 6):

- An increase in turbidity is aesthetically displeasing, reduces light penetration, flocculates planktonic algae, and decreases availability of food.

- Oxygen depletion followed by the release of noxious materials (i.e., methane, sulfides, and heavy metals).

5.3.1.4 Construction Waste Disposal. Removal of trenching spoils unsuitable for backfill because of contamination or other undesirable characteristics, and the disposal of brush, stumps, and waste construction materials, will require suitable disposal areas designated by an appropriate authority.

5.3.2 Long-Term Impact

Some long-term impacts are common to the conveyance system and the treatment facilities, as discussed in Section 5.2. Only those impacts specific to the conveyance system are presented below.

5.3.2.1 Physical Environment. Pumping stations envisioned for the conveyance system will in all cases be located at the outlet works of the treatment plants. These stations will be situated and will be acoustically insulated so as to minimize long-term noise impact. Cleared rights-of-way and ancillary structures can be expected to have some visual impact. Leakage from the conveyance pipeline will have an insignificant impact on groundwater quality. The amount of this leakage will be within the maximum limits specified in the project report.

A major earthquake in the Bay area would have an impact on the pipeline and ancillary structures. This would generally be caused by one or more of the following: (1) liquefaction of loose granular materials; (2) lurch cracking of the ground; and (3) possible flow slides of soft mud in the Bay Channel slopes. All alternative pipeline alignments shown in Figure 5-1 have been selected to avoid soft Bay muds greater than about 20 feet deep. Thus, it is anticipated that the outfall pipeline will in all cases be founded on the stiff clays underlying the soft muds. These stiff clays would generally provide excellent support to the pipeline and would

act to protect it against damage from external causes. The soil would be disturbed during construction and placing of the backfill, but, with proper construction techniques, the permanent impact on the ground and subsurface conditions would be minimized. Compacted backfill would be used around the pipeline in the case of the "on land" alignment. For the "estuarine" alignment, imported granular material would be employed as backfill to the top of the pipe. These backfill techniques would be expected to provide adequate protection to the pipeline for all but devastating earthquake forces.

5.3.2.2 Biological Environment and Water Quality. The primary biological impact of the operation of the proposed conveyance system will be the addition of some 225 mgd of treated dry weather flow and about 400 mgd of treated peak wet weather flow to the Bay (year 2000 flow rates) in an area north of the Dumbarton Bridge. This will produce a a slight decrease in water quality in the immediate vicinity of the diffuser. Some disruption of aquatic species might result from the release of nutrients, decrease in dissolved oxygen, and the increase in turbidity at the point of discharge.

Improvement in overall water quality and subsequent recovery of South Bay biota is expected to be a benefit realized from the removal of this effluent from south of the Dumbarton Bridge. Increases is dissolved oxygen, decreases in nutrient and toxin loads, and changes in inflow patterns to the South Bay, will permit more sensitive species to reestablish. Despite this, shellfish consumption will probably continue to be prohibited by the State Public Health Department because of the excessive pollutional load from uncontrolled surface runoff.

5.3.2.3 Long-Term Effects of Construction Dredging. The possibility of adverse long-term effects due to dredging is usually attributed to the presence in the sediments of constituents such as biostimulants (phosphates and nitrates) and toxins (heavy metals, pesticides, etc.) (5). Unlike

volatile solids which are incorporated in the sediments, and, on mixing, can exert a demand for dissolved oxygen, biostimulants and toxins are often chemically or physically sorbed within the sediment matrix. Constituents sorbed on the sediment particles are not as readily available to the food chain as dissolved materials. Dredging can disturb the sediments and make these constituents available.

5.4 ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED IF THE PROPOSAL IS IMPLEMENTED

5.4.1 Adverse Impacts that Cannot be Reduced in Severity

5.4.1.1 Treatment Plants. During the construction of the treatment plants, problems such as noise, erosion, traffic disturbance and air pollution such as dust, will result. Inasmuch as the wastewater treatment plants are already separated from residential areas, there is expected to be little impact on the general public and the wildlife habitat.

After construction has been completed, nominal noise, air pollution and traffic can be expected from the normal operation of a wastewater treatment facility. These effects are not expected to be reduced in severity nor are they expected to be objectionable.

The long-term visual impact of the treatment plant improvements will be confined to the people in the immediate proximity of the sites.

The operation of the wastewater treatment facilities will result in some unavoidable adverse effects, due to the nature of the treatment process necessary to achieve effluent water quality standards. With increased loading to the plants and increased removal efficiencies, there will be an increased quantity of sludge to be disposed of, with a resultant impact

on sludge disposal sites and a consequent increase in traffic, accompanied by an increase in air pollution and noise. It has been proposed that sludge incineration be used, reducing the impact on sludge disposal sites and traffic. Air pollution from sludge incineration would, however, be increased.

5.4.1.2 Conveyance System. The short-term effects associated with the construction of the conveyance system, such as noise, dust, erosion and traffic disturbances, could be considerable.

The pipeline right-of-way must have a minimum width of 75 feet and an optimum width of 150 feet to accommodate the construction equipment activities (the additional right-of-way width specified is necessary to provide an area for temporary spoil storage, and for temporary and permanent access).

Operation of construction equipment for the duration of the pipeline construction, and associated noise, may disrupt the normal activities of the resident and migrant wildlife in the area. The time of the year of the proposed construction could also have a significant effect on the breeding habits of certain species. Further, brush, stumps, unusable spoils, rocks and other materials generated by construction would have to be disposed of as directed by the regional authority.

The right-of-way would be subject to erosion for a number of months during the construction period, until a stabilizing cover of vegetation or other covers could be emplaced. The movement of heavy construction equipment along the route would require the unavoidable consumption of diesel fuel and the production of air pollutants.

Construction of the offshore pipeline and diffuser section will disturb the Bay bottom in an area 1 to 3 miles north of the Dumbarton Bridge. Preparation of the submerged trench and ingress and egress points in the banks

would result in a significant but unavoidable turbidity and siltation of the Bay. The disrupted area could release organic matter to the water, thereby increasing the BOD and decreasing the dissolved oxygen concentration. It is not expected that the oxygen level will be depleted such that fish habitat and other organisms will be affected. Any detrimental effect from dredging should be short lived because of the large interchange and movement of water in the vicinity of Dumbarton Bridge.

The "on land" alternative route for the interceptor pipeline will require a 150 foot wide construction easement to accommodate the pipeline. This pipeline will be in a corridor that will not involve the demolition of any existing structures or the displacement of any people. It may displace or impair surrounding habitats and it is expected to destroy the terrestrial vegetation in the corridor. It is expected to take many decades for this vegetation to return to its present state of development (i.e., the outer 50 foot sections of the easement). On a long-term basis, namely for the design lifetime of the pipeline (50 years), substantial vegetation, and structures, should not be placed on the center 50 foot section of the easement because of the possibility of pipeline repair.

On the other hand, species from marshlands, mudflats, salt ponds, sloughs, and deep water areas, are expected to return to the present state of development within a few years.

5.4.2 Adverse Impacts that can be Reduced to an Acceptable Level but not Eliminated

5.4.2.1 Treatment Plants. A number of adverse impacts can be reduced to an acceptable level but not eliminated. These are related to air pollution, noise, and the construction effects on land, specifically from engine-powered construction equipment.

The proposed improvements are already in the vicinity of the existing wastewater facilities, and the utilization of three regional plants for upgrading wastes from other areas will centralize any adverse aesthetic impact on a single site. After construction has been completed, both air pollution and noise will be related to vehicles and machinery necessary for the operation of wastewater treatment plants.

5.4.2.2 Conveyance System. The adverse effects of an underground pipeline can be reduced in severity if a pipeline route is chosen that minimizes the destruction of the vegetation that is valuable and difficult to replace.

The cleared 50 foot permanent right-of-way is expected to have a long-term visual impact. This impact can be reduced in severity but not eliminated If the easement is restored (if the "on land" alternative is chosen) by providing riding and hiking trails along the shoreline.

The exfiltration of wastewater into the groundwater system with possible contamination thereof can have a long term impact on the groundwater quality. Through proper design and construction procedures, this impact will be reduced to a minimum.

Maintenance dredging will not be necessary to keep the diffuser area free of sediment and debris since the diffuser section will be located where the bottom material is hard and stable. Further, the turbulence created by the discharge of 175-365 mgd of wastewater is expected to result in a minimal amount of bottom scour, and have a minimal effect on Bay water quality and Bay biota.

5.4.3 Reason Proposal was Chosen Despite Adverse Effects

This proposal was chosen despite the adverse effects because it is necessary to upgrade the present wastewater treatment plants in terms of the quality of the treated effluent, and to convey treated wastewater to disposal

areas providing a greated capacity for receiving wastewaters. Also, it is the opinion of many concerned people, that the extreme southern reach of the South Bay area is no longer an environmentally acceptable area of the Bay for discharge.

5.5 MEASURES PROPOSED TO MINIMIZE THE IMPACT

A certain amount of unavoidable temporary disturbance will occur during the construction phase. Heavy equipment will be utilized for earth movement, grading, and compaction. These activities create noise, dust, and possible erosion problems which can be mitigated. These problems, however, can be confined to the plant site, with the possible exception of noise.

Control of dust resulting from the use of heavy equipment will be mitigated by proper application of plant water. Erosion due to runoff water from graded or excavated areas will be alleviated by installation of drainage systems for containment and control, revegetation, or other appropriate means that will assure protection and enhancement of the local environment.

All wastes generated from construction activities will be handled and disposed of by acceptable and approved methods.

A primary problem associated with the operation of the Sunnyvale plant is the generation of sludge and its disposal. However, Palo Alto has sludge incinerators and San Jose/Santa Clara is expected to have them by 1985, hence sludge disposal is not expected to be a problem from these two plants after 1985.

Diesel powered trucks will be utilized for transporting these materials to approved disposal areas. Mitigating measures, which can reduce adverse environmental effects resulting from increased trucking activity, include installation of the most advanced antipollution control equipment,

continual maintenance, and careful routing to avoid highly sensitive areas. Safety and the effects of air and noise pollution are the major considerations. Routing around residential areas, parks, playgrounds, and schools, and planning routes which avoid commuter congestion will aid in minimizing adverse conditions.

Unpleasant visual effects which result from these facilities can be minimized by landscaping and adoption of low profile designs. Visible components and operations of the system will be designed to have the least possible adverse aesthetic impact within reasonable engineering limitations, including such design details as venting structures and other line facilities flush with the land surface. Odors will be controlled by keeping all units in an oxidized condition or otherwise appropriately contained. Disturbances associated with the construction of conveyance and collector lines between existing plants can be minimized by appropriate routing and scheduling of work.

Some of the unavoidable impacts of the conveyance system can be mitigated to some extent. Construction techniques would be developed to permit breaching of levees without allowing leakage of salt water out of the Leslie Salt Company evaporation ponds. In addition, construction in the salt ponds would be handled in such a way as to prevent interruption of flow within the ponds, if the "estuarine" alternative pipeline alignment is in fact chosen for construction.

Other appropriate construction techniques will involve:

- Cofferdams and diking to prevent run-off of spoils and erosion of construction areas.
- Appropriate draining of trenches to prevent damage to the surrounding lands while maintaining the integrity of groundwater.
- Construction of the pipeline through sensitive habitats may have to be confined to certain periods of the year.

Restoration of the corridor right-of-way and reestablishment of compatible activities within the pipeline right-of-way will be undertaken after construction is complete. Restoration of sensitive marshland habitats at pipeline crossings to natural conditions will be according to accepted marshland restoration procedures.

Rights-of-way through salt ponds will be restored to the original pond level. Rights-of-way through parklands at Palo Alto (for the "on land" pipeline alignment) would be used for compatible trail activities, such as bike trails and nature walks, and similar type activities.

The landward soils would be disturbed during construction and placing of the backfill, but construction techniques will be utilized to minimize the permanent impact on the ground and subsurface conditions.

To minimize the impact of the bayward soils, studies will be made during the pipeline design phase to locate problem areas (i. e., Bay mud underlain by granular sorts) and to develop procedures so that the influence of dewatering will not significantly affect structures or drainage patterns.

Where soft surficial Bay mud soils are present, special designs will be provided to protect the pipeline from damage, which could occur from lurching of the soft Bay mud soil or from flow slides occurring in the off-shore channel slopes. Particular attention will be paid to bedding of the pipeline and partly surrounding it with strong materials in areas where there are surficial soft Bay mud deposits which could be subject to lurch cracking.

During the final design and investigations for the project, studies will be made to assess the possibility of liquefaction of granular materials found below the water level, where liquefaction could cause some deformation of the pipeline.

Both the pipeline and pumping station designs will be coordinated to insure that support for both the plant and the pipeline will be in the same firm soil below the soft surficial Bay mud. Where necessary, the pumping stations will be founded on pile supports penetrating to firm material.

part II

Proposed Program

Section 6 The Relationship between Short-Term Use of the Environment and the Maintenance and Enhancement of Long-Term Productivity for the Proposed Program

Section 6

THE RELATIONSHIP BETWEEN SHORT-TERM USE OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY FOR THE PROPOSED PROGRAM

The upgrading of the present treatment facilities at the three wastewater treatment plants will require the use of additional land adjacent to the present plant. The land is already zoned for such activity and is already disrupted as a result of previous land use practices. Thus the land does not support a wide variety of wildlife species, although some species do reside and find occasional food, water and shelter in this area.

The effects of construction, including dust, erosion, noise and visual impact, will be of short duration, and no long-term environmental degradation is anticipated. The completed installation, however, could have an ongoing visual impact to nearby residents and travelers on adjacent roads. Attention to landscaping could significantly lower the visual impact of the installation.

Once operational, the treatment plants will have a number of long-term requirements. Increased quantities of chemicals will have to be produced and delivered to the treatment plants. Electrical energy will be required in addition to that produced at the plants for the operation of pumps, motors, and lighting.

It is expected that the chlorine requirements will be reduced after the upgraded facilities are added. Dechlorination facilities will be provided to minimize the adverse impact of free chlorine on marine biota.

Landfill disposal of the dried sludge, or incinerator ash, will be a continuing requirement. This material will have to be hauled over public streets and freeways to landfill sites. The resulting noise, traffic hazard, and air pollution impacts will be of a long-term duration.

The "on land" portion of the conveyance system pipeline will require a 50 foot permanent right-of-way through agricultural, commercial, recreational areas, and wildlife habitats. The areas used for the pipeline route supports a number of varieties of wildlife species, including several endangered species. The effects of construction of the onland pipeline, including dust, erosion, noise, and visual impact will be of short duration. If properly controlled and regulated by the contractor, the only long-term environmental degradation would be related to the destruction of any old and established vegetation in the area of the pipeline.

Construction and operation of the conveyance system will, however, withdraw lands within the pipeline right-of-way from productive use. As the pipeline is buried, there will be no ongoing visual impact.

If the "on land" alignment is selected, the potential exists for utilization of the right-of-way as a riding and hiking trail or a similar park type activity. Major permanent structures would be prohibited within the right-of-way.

Once operational, the land portion of the pipeline is not expected to have any long-term requirements except for electrical energy requirements at the treatment plant site pumping stations.

The effects of construction of a pipeline along the "estuarine" alignment will disrupt the bottom organisms and sediments and create localized areas of high turbidity. Besides removing the bottom organisms, the

disruption of the bottom could release organic matter to the water, thereby increasing BOD and decreasing the dissolved oxygen concentration. It is not expected that the oxygen level will be depleted to such extent that the fish habitat and other organisms will be affected, but the increased turbidity and associated activity may cause mobile organisms to move to a more quiescent area. Any detrimental effect from this operation should be short-term because of the short construction time expected. Once operational, the offshore portion of the pipeline is not expected to have any long-term environmental effects.

A number of environmental improvements will result from the wastewater treatment plant additions and the upgrading procedures and the interceptor/outfall system. The program will remove a peak wet weather flow of about 400 mgd of highly treated sewage effluent (2000 flow rate) from that section of the Bay south of the Dumbarton Bridge. This will alleviate the pollution load to the South Bay area and improve the overall condition of the water in this area. This high quality effluent will be discharged into a more acceptable protion of the Bay (in an area one to three miles north of the Dumbarton Bridge), thus protecting the beneficial uses of South Bay waters and allowing recovery from past pollution loading in South San Francisco Bay. These waters may eventually become more suitable for recreation and for fish and other organisms. The inherent flexibilty of the conveyance system allows for diversion of this effluent from the Bay to either total reuse or to an ocean discharge. Movement of the discharge point northward in the Bay would further protect Bay water quality and beneficial uses. Furthermore, a portion of the wastewater might be reused by agriculture, by industry, or may under certain condtions serve as direct groundwater recharge. Through groundwater recharge, the water shortage in these groundwater basins could be alleviated and could serve as a municipal water source provided public health requirements are met.

part III

Proposed Program

Section 7 Any Irreversible Environmental Change which would be Involved in the Proposal Action should it be Implemented for the Proposed Program

Section 7

ANY IRREVERSIBLE ENVIRONMENTAL CHANGES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

A small increment of land adjacent to the existing treatment facilities in San Jose/Santa Clara and in Sunnyvale will be needed to accommodate the upgraded plant facilities. This land acquisition will not involve the demolition of any existing structures or displacement of people but it may displace or impair surrounding habitats.

The Sunnyvale plant is the only one of the three plants with sludge to be disposed of in an off-site sanitary land-fill. This reduces the landfill site's capacity for municipal refuse, introduces problems caused by sludge water content and limits the amount that specific sites may accept (i. e., controlled by the California Water Quality Control Board).

The "on land" alternative route for the interceptor or conveyance pipeline will require a 150 foot wide construction easement to accommodate a buried pipeline up to 8.5 feet inside diameter. The permanent right-of-way will be 50 feet wide. The pipeline will be in a corridor such that land acquisition will not involve the demolition of any existing structures or the displacement of any people, but it may displace or impair surrounding habitats during the construction phase.

Future development in the pipeline easement will be restricted to land uses compatible with the operation and maintenance of the pipeline. The land use patterns compatible with an onland pipeline can constitute an irreversible commitment of resources. For the duration of the pipeline

program (in excess of 50 years), substantial vegetation or structures should not be placed in the easement above the pipeline.

The "estuarine" alternative route for the pipeline will simply displace or impair habitats during the construction phase and whenever maintenance dredging is necessary.

Construction and building materials constitute an essentially irreversible commitment of resources. The upgrading of wastewater treatment plant facilities will involve the following major components:

- Vacuum filters
- Incinerators
- Dual-media filters
- Settling tanks
- Nitrification tanks
- Flotation tanks
- Chemical storage, feeding and measuring equipment

The above facilities represent a substantial quantity of upgraded natural resources, and expenditure of productive labor.

The interceptor/outfall pipeline involves two major components: a pipeline and a diffuser section.

The major resources committed due to the operation of the wastewater treatment plant facilities and the interceptor/outfall include:

- Chemicals
- Natural gas
- Electricity
- Diesel fuel

The risk of environmental accidents exists during the operational phase of the system. Seismic activity in the area is of major concern and presents a threat to the structural integrity of the facilities and the pipeline. Appropriate protective measures will be used to minimize the danger and damage to the surrounding area due to facility failure.

part II

Proposed Program

Section 8 The Growth Inducing Impact of the Proposed Program

Section 8

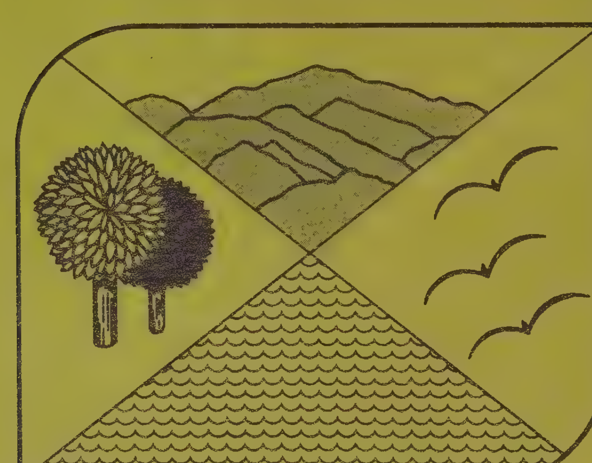
THE GROWTH INDUCING IMPACT OF THE PROPOSED PROGRAM

The population in the Palo Alto and Sunnyvale area is near saturation. Thus, only minimal increases in treatment plant capacity requirements are expected in the future. The San Jose/Santa Clara treatment facility is served by wastewater service districts occupying less than 50 percent of the land area in Santa Clara County, but the facility serves about 95 percent of the present population.

The availability or the expectation of adequate treatment and conveyance facilities could stimulate population growth. While lack of these facilities could slow down the growth rate, it could also result in continuation or aggravation of present water pollution conditions.

part III

Alternatives To The Proposed Program



part III

Alternatives To The Proposed Program

Section 9 Viable Alternatives

Section 9

VIABLE ALTERNATIVES TO THE PROPOSED PROGRAM

Sections 9-15 of this report contain the environmental information necessary for the development of the alternatives discussed in Section 3. Further information on the environmental setting, as it pertains to the alternatives, is presented in Sections 16-17. As stated previously in Section 3, the viable alternatives are:

- Alternative 1 — Modification of Proposed Program eliminating Sunnyvale plant. Combined treatment and disposal north of Dumbarton Bridge; wastewater treatment plants at Palo Alto, and San Jose/Santa Clara (Figure 9-1).
- Alternative 2 — Local treatment and local disposal to the nearest deep water; wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/ Santa Clara (Figure 9-2).
- Alternative 3 — High level local treatment and continuation of effluent discharge to existing disposal points; wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/Santa Clara (Figure 9-3).
- Alternative 4 — Modification of Alternative 3 eliminating Sunnyvale treatment plant. High level local treatment and continuation of effluent discharge to existing disposal points for Palo Alto and San Jose/ Santa Clara; wastewater treatment plants at Palo Alto, and San Jose/Santa Clara (Figure 9-4).
- Alternative 5 — Ocean Disposal; wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/Santa Clara (Figure 9-5).
- Alternative 6 — "No Project." Wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/Santa Clara (Figure 9-6).

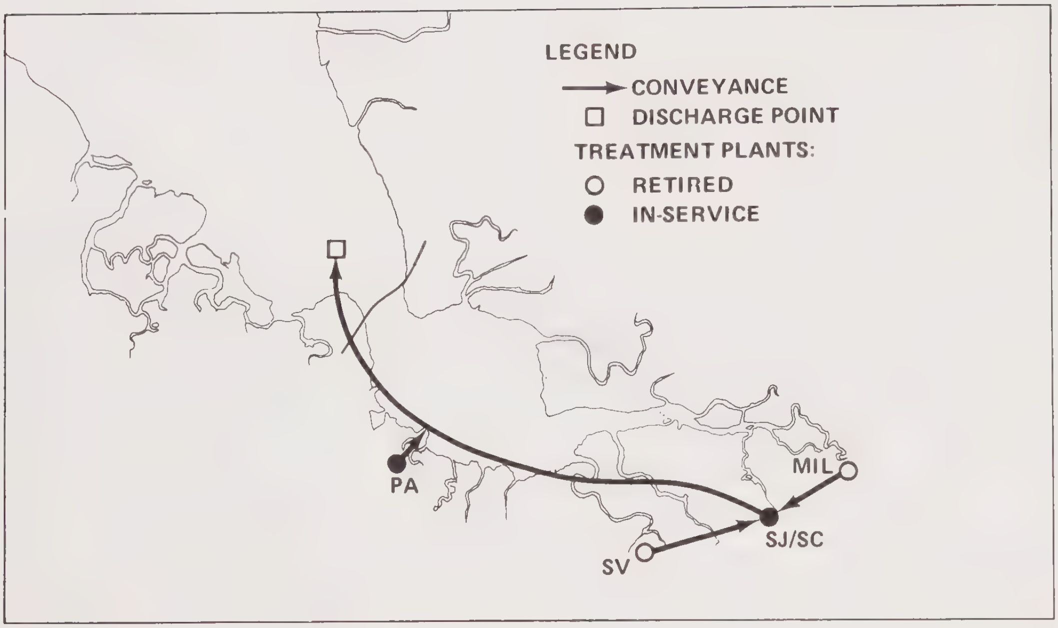


Figure 9-1. Alternative 1 — Modification of Proposed Program eliminating Sunnyvale plant. Combined treatment and disposal north of Dumbarton Bridge; wastewater treatment plants at Palo Alto, and San Jose/Santa Clara.

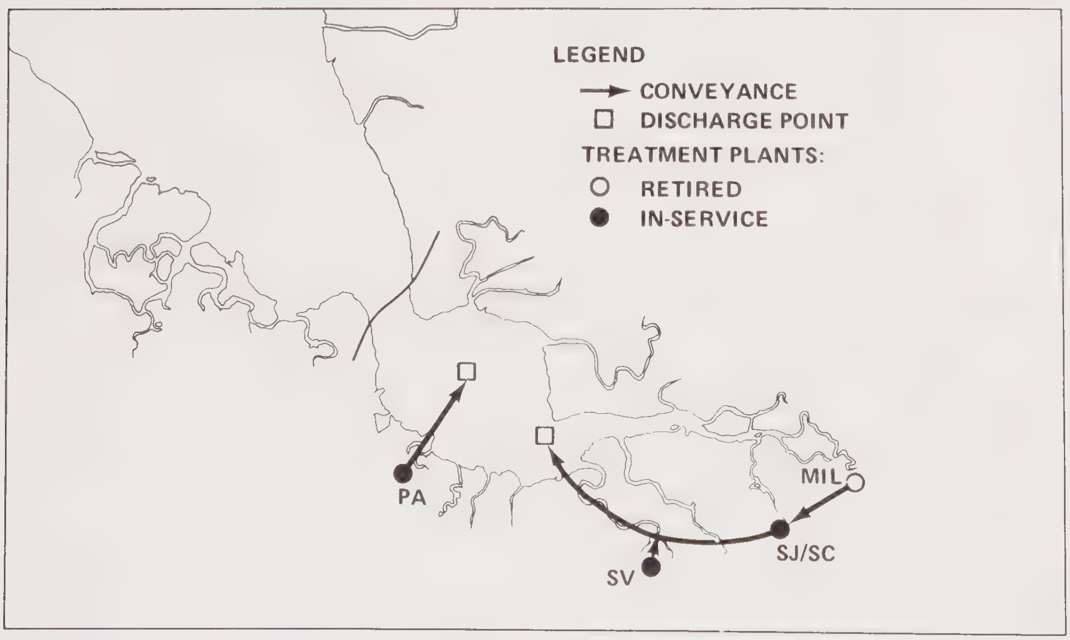


Figure 9-2. Alternative 2 — Local treatment and local disposal to the nearest deep water; wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/Santa Clara.

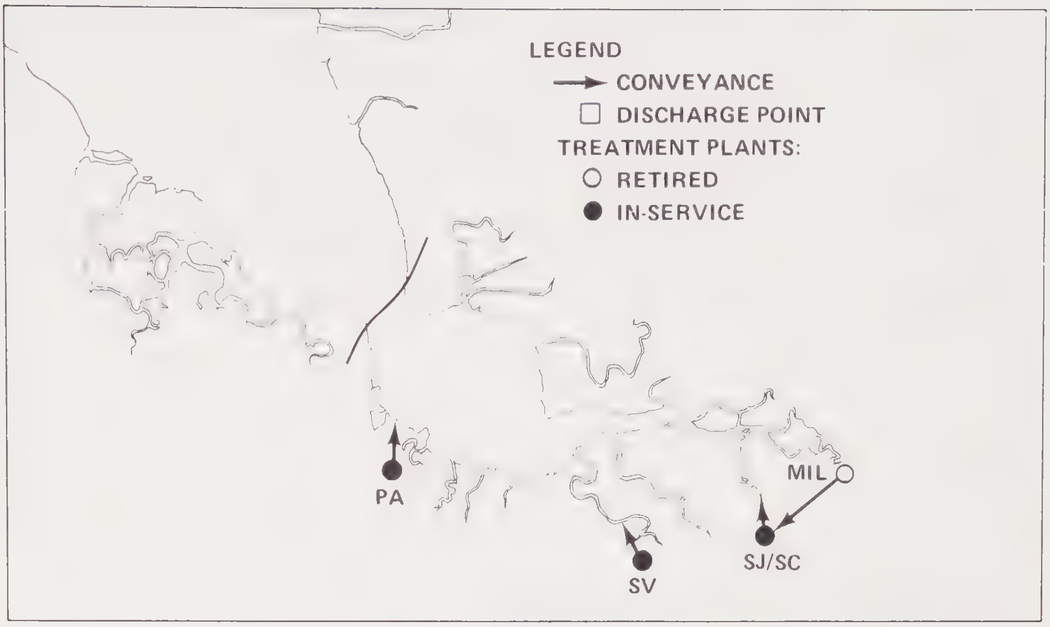


Figure 9-3. Alternative 3 — High level local treatment and continuation of effluent discharge to existing disposal points; wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/ Santa Clara

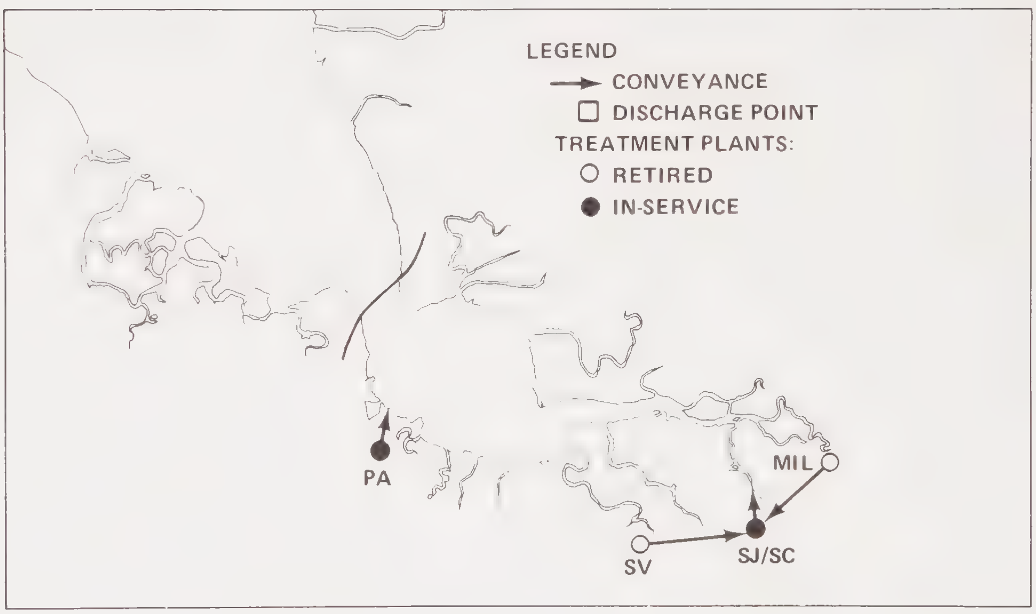


Figure 9-4. Alternative 4 — Modification of Alternative 3 eliminating Sunnyvale treatment plant. High level local treatment and continuation of effluent discharge to existing disposal points for Palo Alto and San Jose/Santa Clara; wastewater treatment plants at Palo Alto, and San Jose/Santa Clara

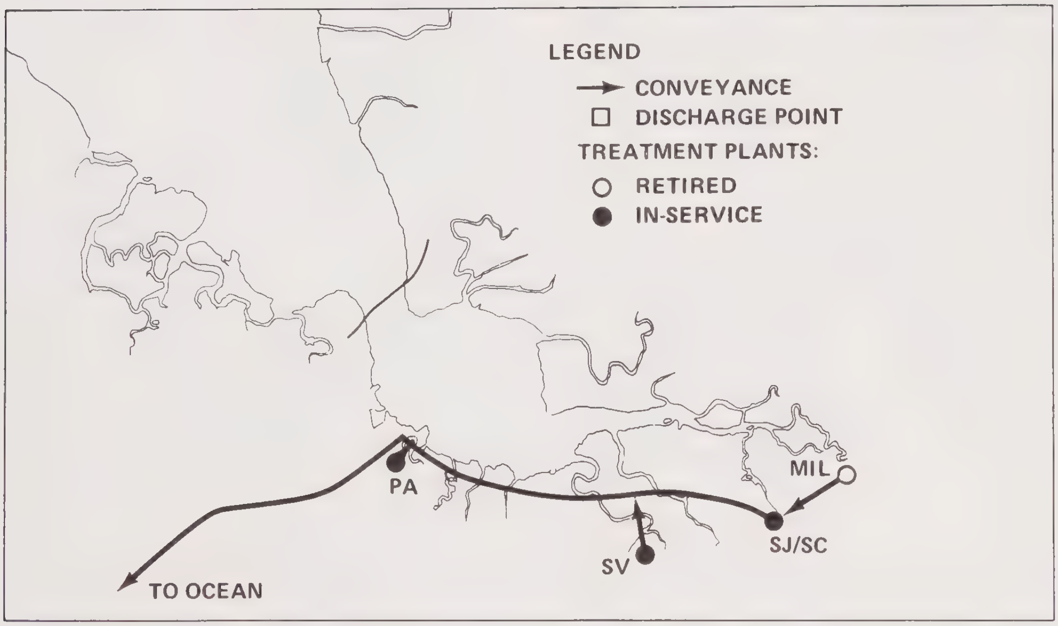


Figure 9-5. Alternative 5 — Ocean Disposal; wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/Santa Clara

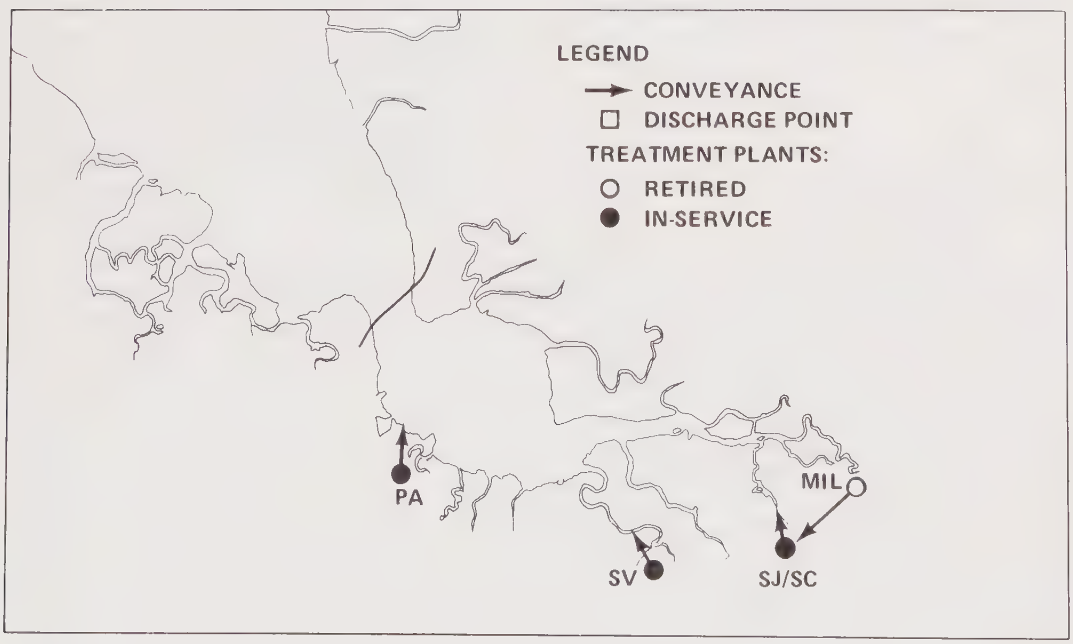


Figure 9-6. Alternative 6 — "No Project." Wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/Santa Clara

Reclamation and reuse are not separate and distinct alternatives, but instead have the potential to be a part of the six viable alternative systems and the Proposed Program discussed herein. There are two major reclamation and reuse options applicable to the South Bay area as follows: reclamation and reuse in Santa Clara County; and, a regional reclamation and reuse system.

In both cases, extensive consideration has not been given to these reclamation and reuse options because of the lack of: a definite projected water market; a suitable technology to produce water that will satisfy public health considerations with reliability and economically; and extensive background material and data that establishes a definite reclamation and reuse option that can be evaluated environmentally.

The formal development of an environmental impact analysis of a reclamation and reuse option as part of the six alternative systems, followed by a comparison with the Proposed Program, would require that a specific project be formulated for each. Such items as description of proposed project facilities, their locations, and their interrelationship with other scheduled projects would be included.

Because such information does not exist for the important reclamation and reuse options, their environmental impact evaluation will be limited to consideration of the potential interrelationship between the options and the Proposed Program and alternatives thereto.

The State guidelines for environmental impact report preparation provide for such conceptual treatment of alternatives. The guidelines in Section 15072, state: "A project involving only feasibility or planning studies for possible future actions which the agency, board or commission has not approved, adopted or funded does not require the preparation of an environmental impact report but does require consideration of environmental factors as required by Section 21102 of California Environmental Quality Act."

part III

Alternatives To The Proposed Program

Section 10 Alternative 1

Section 10

ALTERNATIVE 1

10.1 DESCRIPTION OF THE PROGRAM

In this alternative, Sunnyvale's wastewater would be conveyed to San Jose/ Santa Clara for treatment. The treated wastewater would be conveyed along the west side of the Bay to Palo Alto where the treated wastewater from the Palo Alto plant would be discharged into the conveyance pipeline. Final effluent disposal would be through an outfall north of the Dumbarton Bridge (Figure 10-1).

10.2 ENVIRONMENTAL SETTING

See Section 4 and 16 for a description of the environmental setting for this alternative.

10.3 ENVIRONMENTAL IMPACT

The environmental impacts of the alternative are as described in Section 5 with the following further modifications.

The local impact of a treatment plant adjacent to the Sunnyvale Shoreline Park would be eliminated. This includes noise impact, air pollution, odors, the aesthetics of a treatment plant in a park, and the land occupied in the park that could be put to other uses.

On the other hand, a number of employees of the Sunnyvale treatment plant may be put out of work, Further, a conveyance pipeline will have to be constructed to transfer the raw wastewater from Sunnyvale to the San Jose/

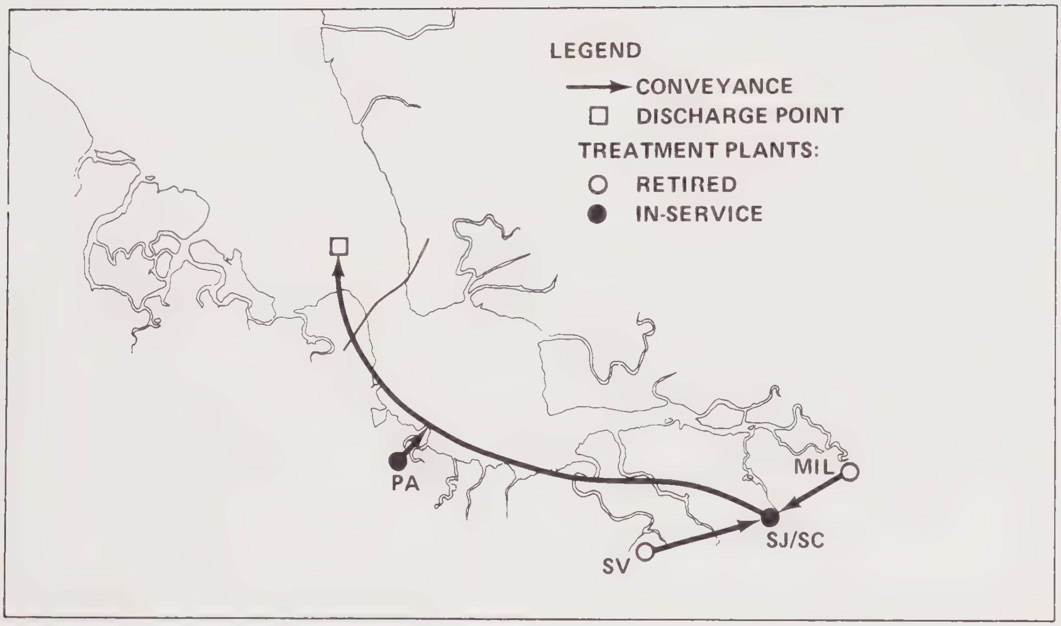


Figure 10-1. Alternative 1 — Modification of Proposed Program eliminating Sunnyvale plant. Combined treatment and disposal north of Dumbarton Bridge; wastewater treatment plants at Palo Alto, and San Jose/ Santa Clara (Figure 9-1).

Santa Clara treatment plant. The impact of the construction of a pipeline of this type is discussed in Section 5.

Effects on receiving water quality would be no different from the Proposed Program, because the degree of treatment is expected to be equivalent at both the San Jose/Santa Clara or Sunnyvale plants.

The unavoidable adverse impacts are as discussed in Section 5 except for the modifications mentioned above.

The mitigation measures to alleviate adverse impacts are also discussed in Section 5, except for the modifications mentioned above. The local short-term and long-term uses of the environment would be enhanced because of the availability of the land presently occupied by the Sunnyvale treatment plant (see Section 6). The irreversible environmental changes are as discussed in Section 7 except for the mofifications mentioned above.

No change in growth is expected from that stated in Section 8.

part III

Alternatives To The Proposed Program

Section 11 Alternative 2

part III

Alternatives To The Proposed Program

Section 11 Alternative 2

Section 11

ALTERNATIVE 2

11.1 DESCRIPTION OF PROGRAM

In this alternative, each discharger would continue individual treatment and discharge to the nearest deep water (Figure 11-1). The San Jose/Santa Clara and Sunnyvale plants, would upgrade their treatment processes to include biological nitrification and filtration. The Palo Alto plant would theoretically not need to provide nitrification, but might actually be required to do so to meet "best practical treatment."

Milpitas would convey their raw water to the San Jose/Santa Clara plant for treatment. Treated wastewater would be conveyed to disposal points in the Bay as follows: Palo Alto to a point offshore from the Palo Alto yacht harbor; and, Sunnyvale and San Jose/Santa Clara to the vicinity of Calaveras Point, through a joint outfall. These are the southernmost deepwater points in the Bay considered acceptable for discharge of the treated wastewater. These discharge locations would provide for discharge at greater than 200 feet from the extreme low water line and would provide suitable water cover over the outfall for navigational clearance. The required operation of the diffuser restricts suitable discharge locations to within the navigation channel in the southern reach. This channel runs from the mouth of Coyote Creek at Calaveras Point, through Dumbarton Straits and then along the western side of the bay to the Bay Bridge.

This program can meet definitive water quality objectives for DO, coliforms and flotable matter, and would result in a considerable improvement over present conditions by removal of discharges from sloughs.

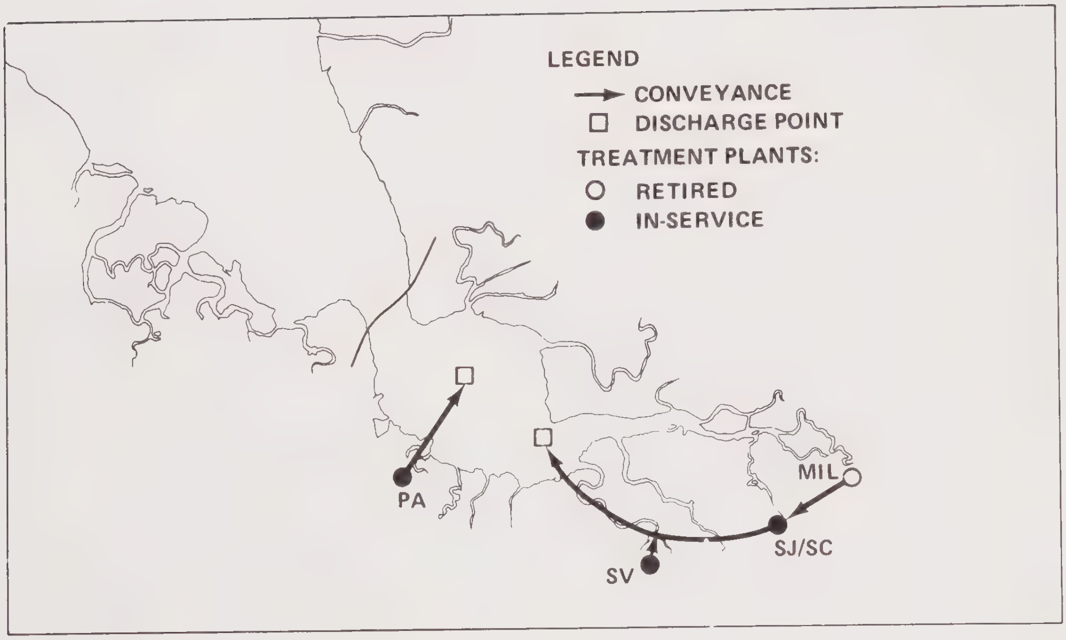


Figure 11-1. Alternative 2 — Local treatment and local disposal to the nearest deep water; wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/ Santa Clara.

However, this approach would violate the San Francisco Regional Water Quality Control Board's existing intention to prohibit discharge to the "southern extremities of the Bay," if such were to be invoked in the future. Further, the system lacks flexibility since investments in local treatment facilities and individual outfall systems would be lost if the South Bay Dischargers were forced in the future to go to regionalized treatment, conveyance and discharge of wastewater out of the extreme South Bay area, or to regional reclamation and reuse projects.

11.2 ENVIRONMENTAL SETTING

See Sections 4 and 16 for a description of the environmental setting applicable to this alternative.

11.3 ENVIRONMENTAL IMPACT

The construction and operational impact associated with the upgraded treatment facilities would be minimal because of the proximity of the upgraded facilities to the present plants (see Section 5).

Two new outfall systems would be provided as follows: 1) San Jose/Santa Clara and Sunnyvale to the vicinity of Calaveras Point through a joint outfall; and, 2) Palo Alto to a point off Palo Alto yacht harbor. These outfall pipelines would have detrimental impacts during construction as the pipeline passes primarily through various water environments (see Section 5).

The unavoidable adverse impacts and mitigation measures are as discussed in Section 5, except for the modifications mentioned above.

The local short-term and long-term uses of the environment, irreversible environmental changes, and growth potential are as discussed in Sections 6, 7, and 8, respectively.

part III

Alternatives To The Proposed Program

Section 12 Alternative 3

Section 12

ALTERNATIVE 3

12.1 DESCRIPTION OF THE PROJECT

This alternative includes high-level local treatment at San Jose/Santa Clara, with lesser level treatment at Sunnyvale and Palo Alto, and continuation of effluent discharge to existing disposal points (Figure 12-1). High-level treatment at San Jose/Santa Clara would include the existing primary and secondary facilities, with the addition of biological nitrification, residual ammonia removal through breakpoint chlorination, filtration, and adsorption on activated carbon for further removal of oxygen-demanding substances and toxicants.

Treatment processes at Sunnyvale and Palo Alto are as discussed in Section 3 for Alternative 2.

12.2 ENVIRONMENTAL SETTING

See Section 4 and 16 for a description of the environmental setting for this alternative.

12.3 ENVIRONMENTAL IMPACT

The environmental impacts of this alternative include impacts attendant to:

- Continued effluent discharge to Artesian and Guadalupe Sloughs
- Construction activities at the treatment plant sites

- Uses of carbon and power in the treatment processes
- Carbon regeneration processes
- Sludge and ash disposal

The discharge of effluent of improved quality from high-level treatment facilities will facilitate the development of healthy freshwater marshland and aquatic systems in the headwaters of Artesian Slough. Reliable flows of fresh water (including the reliable control of toxicants at the source or in the treatment processes) will enable the restoration of viable breeding habitat for ducks and other bird species which require fresh water for the survival of the young. Maintenance of a minimum of 5 mg/l D.O. and a reduction in the input of toxic and biostimulating compounds will result in a potential for improved habitats for freshwater fauna, such as fish, amphibians, crustaceans and molluscs, which form a substantial food source for many aquatic and terrestrial vertebrates.

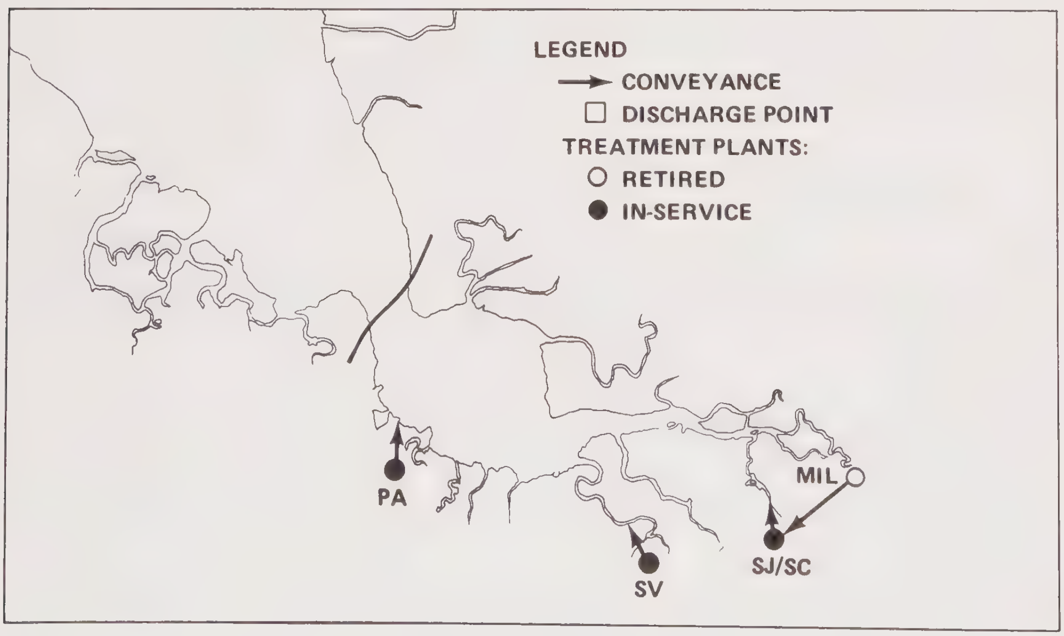


Figure 12-1. Alternative 3 - High level local treatment and continuation of effluent discharge to existing disposal points; wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/Santa Clara.

An improved freshwater marsh at the headwaters of Artesian Slough, and the estuarine system resulting from the tidal flux and effluent flows, will result in an increased habitat diversity within the boundaries of the San Francisco Bay National Wildlife Refuge. Increased habitat diversity can result in:

- Increased species diversity
- Increased ecosystem stability
- Increased appearance and attractiveness to potential refuge visitors

Continued effluent discharges to Guadalupe Slough and the unnamed slough channel off Palo Alto are not expected to result in substantial habitat changes. Increased D.O. levels and decreased biostimulant and toxic compound concentrations, however, could contribute to local improvements in water and sediment quality and ecosystem "health."

Construction activities at the treatment plant sites would result in decreases in potential wildlife habitat from vegetation removal and land grading, increases in noise and air pollution levels and impacts on the visual quality of the area.

Higher levels of treatment require increased consumption of chemicals, such as carbon, and increased power consumption. Supply of these chemicals and the removal of wastes, such as sludge or incinerator ash, will require increased transportation and attendant demands on local roadways, increases in noise and air pollutants and some visual impact, locally.

If carbon is regenerated on-site, local increases in air pollution could be expected.

In this alternative, impacts as a result of conveyance system construction and operation can be avoided with resultant maintenance of maximum flexibility for wastewater reuse. The cost of construction and operation of high-level treatment facilities, however, may prohibitively increase the cost of these waters for reuse and may result in reluctance and/or inability of the discharge districts to meet changed water quality objectives.

The unavoidable adverse impacts are as discussed in Section 5 except for the modifications mentioned above.

The mitigation measures to alleviate adverse impacts are also discussed in Section 5, except for the modifications mentioned above.

The local short-term and long-term uses of the environment, irreversible environmental changes, and growth potential are as discussed in Sections 6, 7, and 8, respectively.

part III

Alternatives To The Proposed Program

Section 13 Alternative 4

Section 13

ALTERNATIVE 4

13.1 DESCRIPTION OF THE PROJECT

This alternative, a modification of Alternative 3 (Section 12) includes high-level treatment at San Jose/Santa Clara with a lesser level treatment at Palo Alto, and with conveyance of Sunnyvale wastewater to San Jose/Santa Clara for treatment. Effluent disposal would be at Artesian Slough and at an unnamed slough channel for San Jose/Santa Clara and Palo Alto, respectively (Figure 13-1). Treatment processes are as described in Section 12.1.

13.2 ENVIRONMENTAL SETTING

See Sections 4 and 16 for a description of the environmental setting for this alternative.

13.3 ENVIRONMENTAL IMPACT

The environmental impacts of Alternative 4 are as described for Alternative 3 (see Section 12.3) with the exception of those impacts resulting from the discontinued use of the Sunnyvale facilities.

The local impacts of the Sunnyvale treatment plant on the Sunnyvale Shoreline Park, including noise, air pollution, odor, visual impact and commitment of lands, would be eliminated. In addition, oxygen-demanding substances, toxic materials and biostimulants in the waste effluent will be removed from Guadalupe Slough.

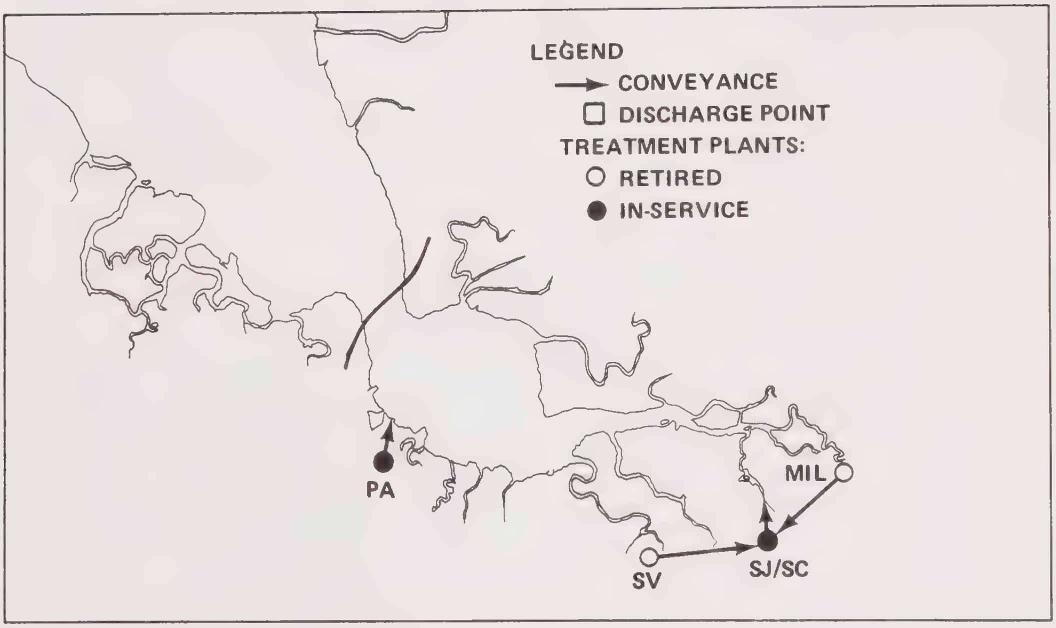


Figure 13-1. Alternative 4 — Modification of Alternative 3 eliminating Sunnyvale treatment plant. High level local treatment and continuation of effluent discharge to existing disposal points for Palo Alto and San Jose/Santa Clara; wastewater treatment plants at Palo Alto, and San Jose/Santa Clara.

The removal of the freshwater flow from Guadalupe Slough could result in changes in salinity gradients and associated habitat changes. These changes are not expected to be significant in that there is no existing freshwater dominated system in the slough at present.

The effects of the construction of a conveyance pipeline from Sunnyvale to San Jose/Santa Clara (Section 5) and other effects of the discontinued use of the Sunnyvale plant are discussed elsewhere in this report (see Sections 3 and 10).

The unavoidable adverse impacts, and mitigation measures to alleviate adverse impacts are as discussed in Sections 5 and 12 except for the modifications mentioned above.

The local short-term and long-term uses of the environment, irreversible environmental changes, and growth potential are as discussed in Sections 6, 7, and 8, respectively.

part III

Alternatives To The Proposed Program

Section 14 Alternative 5

part III

Alternatives To The Proposed Program

Section 14 Alternative 5

part III

Alternatives To The Proposed Program

Section 14 Alternative 5

Section 14

ALTERNATIVE 5

14.1 DESCRIPTION OF THE PROJECT

The ocean disposal alternative would include regional sewage treatment plants at San Jose/Santa Clara, Sunnyvale, and Palo Alto and conveyance of the combined treated effluents from the above three plants to the Pacific Ocean, approximately seven miles offshore at a point about six miles south of Half Moon Bay (Figure 14-1).

Treated wastewater from the San Jose/Santa Clara and Sunnyvale plants would be pumped to Palo Alto, as in the Proposed Program. From this point the conveyance facility would proceed via pipeline and tunnel to a point in the vicinity of Martin's Beach on the coast (about six miles south of Half Moon Bay). From the coast line, the pipeline would proceed in a westerly direction seven miles into the Pacific Ocean for discharge through a diffuser section at a depth in excess of 200 feet.

It is expected that an initial dilution factor in excess of 100:1 would be achieved. The location of the diffuser section would be such that it is not expected that the ocean currents would bring any of the wastewater back into San Francisco Bay.

The export of the treated wastewater to the ocean would remove the pollutant problems from the Bay. By properly designing and locating the ocean outfall, it is expected that the treatment facilities described by

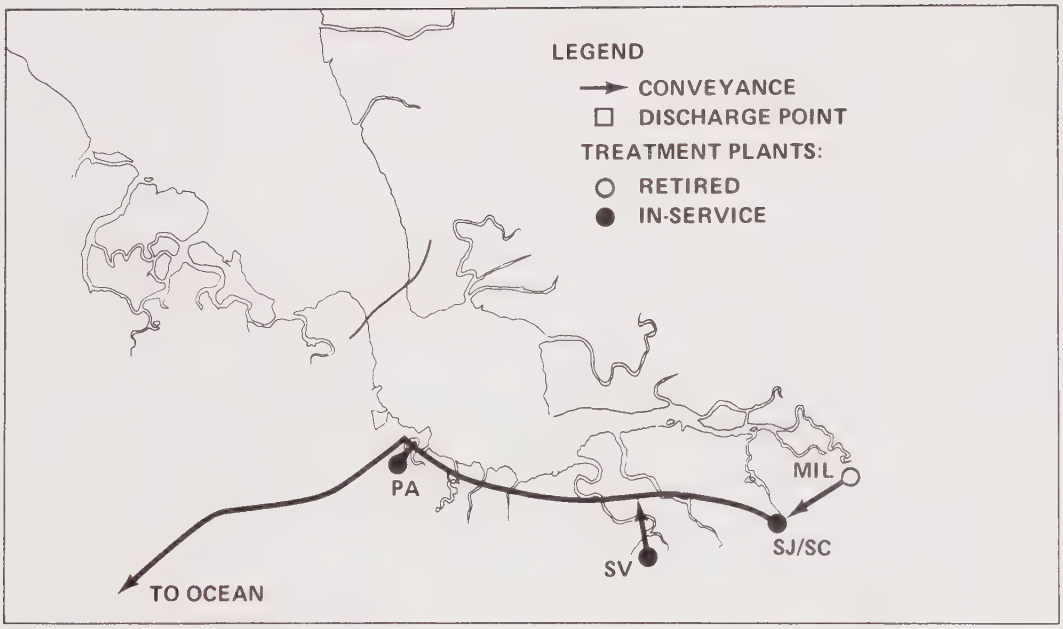


Figure 14-1. Alternative 5 — Ocean Disposal; wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/Santa Clara.

the Proposed Program are capable of producing a wastewater with a quality that, when it is released to the ocean, the water quality objectives of the ocean would be met (see Appendix D).

The ocean discharge system is inflexible with respect to changing the discharge point in the ocean, and commits the area to a specific conveyance system that involves large capital costs. The public pressure for reclamation might be less, due to the inflexibility and large capital investments.

The system is the most costly of the alternatives. However, there are some flexibility factors in its favor:

- The system could accommodate San Mateo County and the East Bay Dischargers in the event general ocean disposal was required; however, the tunnel portion of the conveyance would have to be designed for this contingency in advance.
- The treatment plant processes could be upgraded to meet future standards.
- A portion of the future flows could be diverted at San Jose for reclamation and reuse purposes.

14.2 ENVIRONMENTAL SETTING

See Sections 4, 16, and 17 for a description of the environmental setting applicable to ocean disposal.

14.3 ENVIRONMENTAL IMPACT

Construction activities would have an effect on the water quality of the Pacific Ocean. Since dredging would be required to excavate a trench for the pipeline, turbidity would increase for the duration of the construction phase of the offshore pipeline. A substantial quantity of material would have to be removed from the ocean bottom during the placing of the pipeline and disposal of this dredge material would be necessary.

Mineral resources would be depleted by the use of considerable quantities of concrete, steel, and of rock and gravel.

For the impact of dredging and the balance of the treatment and conveyance system on the ecosystem, see Section 5.

Clearing the right-of-way and construction of the trench for the ocean conveyance line would have impacts on terrestrial, intertidal and offshore habitats. Portions of terrestrial habitat between Palo Alto and the coast would be disrupted where trenching activities take place. Construction of a tunnel through the coastal range would limit impacts on coastal forests

but portions of grasslands, woodland-grassland, broadleafed evergreen forests and coastal scrub would be affected. In addition, in those places where the pipeline must cross stream beds, portions of aquatic or riparian habitats would be affected. The degree of impact would depend on the amount of habitat removed, the availability of suitable habitat for the emigration of disturbed wildlife, and the length of time necessary to establish right-of-way vegetation. The cleared, partially revegetated right-of-way may result in an increase in habitat diversity, particularly in woodland areas, and this "edge effect" could serve to enhance wildlife populations, particularly those of deer, game birds and other sport species.

The right-of-way clearing through intertidal and offshore benthic habitats would remove portions of the populations typical of these habitats. Restoration of right-of-way surface would permit reestablishment of populations. In areas where riprap would be used to prevent erosion, the populations or organisms would be similar to those found on exposed rocky shores and on offshore rocky reefs.

Adverse effects on water quality include the short-term effects connected with the dredging and spoil disposal operations. The effect from dredging and disposal operation would be temporary resuspension of sediments. This resuspension of sediments could have adverse effects on fish, shellfish, crustaceans, and plankton, but the full range and extent is unknown. These impacts would be local in extent and short in duration.

There are some mitigating measures which would be used to reduce the impacts due to dredging. In areas where dredging removes mud, a clamshell dredge should be used. This dredge removes mud in large chunks, thus minimizing the amount that is available to go into suspension and the resultant turbidity is reduced. The pipeline trench would require gravel bedding material and be covered with gravel and boulders to lessen the impact of scour, erosion and undermining of the pipeline.

The major operational impact of the ocean discharge system would be the discharge of treated effluent to the offshore coastal water of the Pacific. The nutrient levels in these effluent waters are not expected to significantly alter the biota of the area, although some conservative constituents might be expected to increase slightly in the vicinity of the outfall. Turbulence might result from the outfall, creating conditions of increased turbidity and altered sedimentation in the vicinity of the outfall. These local effects would be significant if they occurred in the vicinity of shellfish beds or other sensitive habitats.

Construction of a conveyance facility from Palo Alto to a point near Martin's Beach would involve crossing the San Andreas Fault in the Santa Cruz Mountains. The impact on a short-term basis would be minimal, but the long-term (operation and maintenance) impact could be substantial. This would involve the potential breakage of the conveyance conduit.

Under less than a total destructive earthquake, the effect may be limited to cracks in the tunnel lining and the release of the treated wastewater to the surrounding groundwater, with possible contamination thereof, while the major portion of the flow would still proceed to the ocean. Under more severe earthquake conditions, there could be total blockage of the tunnel and a loss of the system's ability to convey the treated wastewater to the discharge point in the ocean.

The major biological benefit of removing the effluent from San Francisco Bay would be the potential recovery of the biota from the present pollution load. Sensitive species such as migrating fish or harvestable shellfish would no longer be exposed to degraded water quality as a result of wastewater discharge to the Bay.

part III

Alternatives To The Proposed Program

Section 15 Alternative 6

Section 15

ALTERNATIVE 6

15.1 DESCRIPTION OF THE PROJECT

This alternative includes the transfer of Milpitas wastewater flows to San Jose/Santa Clara and improvements in treatment currently in final design and/or construction phase (see Figure 15-1).

15.2 ENVIRONMENTAL SETTING

See Sections 4 and 16 for a description of the environmental setting applicable to the "No Project" alternative.

15.3 ENVIRONMENTAL IMPACT

A "no project" option can be expected to result in degradation of water quality in South San Francisco Bay and adjacent waters. Waste loads have increased considerably over the years due to increased population and industrial growth and are expected to continue to increase in the future (1). Past improvements in treatment capacity and increases in level of treatment have not resulted in increased water quality to the extent anticipated. Although general dissolved oxygen levels have improved since the installation of secondary treatment in the South Bay, dissolved oxygen objectives are not attained a large percentage of the time. In addition, a significant increase in algal blooms in the extremities of the Bay has been noted between 1961 and 1971 (7). Expected increases in waste loads without concurrent increases in treatment level can only contribute to further degradation of Bay water quality.

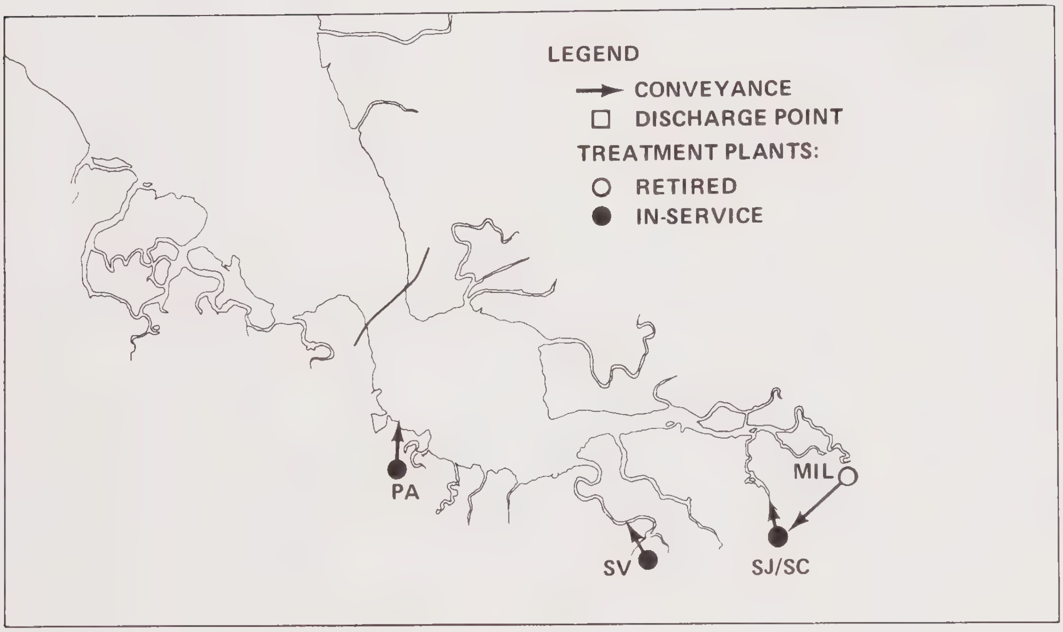


Figure 15-1. Alternative 6 — "No Project." Wastewater treatment plants at Palo Alto, Sunnyvale, and San Jose/Santa Clara

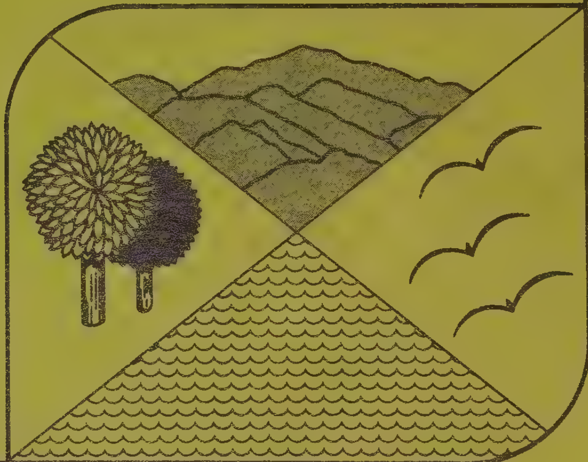
Degradation of water quality results in a decrease in the number of beneficial uses for that water. Of particular importance to the survival of fish and other aquatic species, is the maintenance of a minimum level of dissolved oxygen of 5 ppm. At present, these levels are not maintained, particularly at discharge points, and there is a resultant decrease in numbers of aquatic animals in these areas. Restoration of high quality habitat for aquatic species in the South Bay and in adjacent waters such as Artesian Slough cannot be expected with a "no project" alternative.

Recreational use of Bay waters and sloughs is also restricted by degraded water quality. Low oxygen levels and dense algal blooms can result in noxious odors and visually unattractive algal mats and mats of decaying vegetation. Decreased numbers of birds and fish and restrictions on fish and shellfish harvesting also limit recreational uses. These factors can be attributed to degraded water quality and are not expected to improve under a "no project" alternative.

A "no project" alternative will not contribute to the environmental disruption attendant to the construction and operation of additional facilities and a conveyance pipeline (see Section 5). Local short-term use of Bay waters as receiving waters will result in continued exhaustion of available assimilative capacity and attendant water quality and habitat degradation. Recovery from these short-term uses of the environment will be slow, long-term processes which will result only upon significant increases in treatment levels (see Sections 12 and 13) or upon removal of waste loads from the South Bay. Restoration of the South Bay, therefore, will depend on the eventual adoption of one of the alternative treatment/conveyance schemes presented in this report.

part IV

The Environment



part IV
The Environment

Section 16 Environmental Setting for the Proposed Program and Alternatives Involving Discharge to the Bay

Section 16

ENVIRONMENTAL SETTING FOR THE PROPOSED PROGRAM AND ALTERNATIVES INVOLVING DISCHARGE TO THE BAY

16.1 EXISTING WATER POLLUTION CONTROL FACILITIES

16.1.1 San Jose/Santa Clara Regional Wastewater Treatment Plant

The San Jose/Santa Clara treatment plant is an activiated sludge plant employing the Kraus Nitrified Sludge Interchange Process. Average dry weather flow during the non-canning season is 72 mgd (Figure 16-1). During the canning season, the flow increases by approximately 24 mgd to 96 mgd. The plant has an average hydraulic and biological capacity of 94 mgd. During a typical canning season the hydraulic capacity of the plant is exceeded by 2 mgd. The daily discharge of ultimate oxygen demand (UOD) is about 100,000 pounds (Figure 16-2).

The plant is located approximately five miles north of the San Jose central business area at the intersection of Los Esteros and Zanker Roads. Effluent is discharged to the Artesian Slough which flows into Coyote Creek and thence into San Francisco Bay.

The service area tributary to the treatment plant includes the cities of San Jose and Santa Clara, and the major portion of the Santa Clara Valley. This area covers about 300 square miles and includes the incorporated communities of Campbell, Cupertino, Los Gatos, Monte Sereno, and Saratoga. Other areas served are County Sanitation Districts 2, 3, and 4, and Burbank, Cupertino, and Sunol Sanitary Districts. The Alviso area is scheduled to pump its wastes to the San Jose/Santa Clara plant for treatment by 1973. The plant is designed to serve a population equivalent of up to 3.1 million people during the canning season (July-September).

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*A brief version of the environmental setting is presented in Section 4.

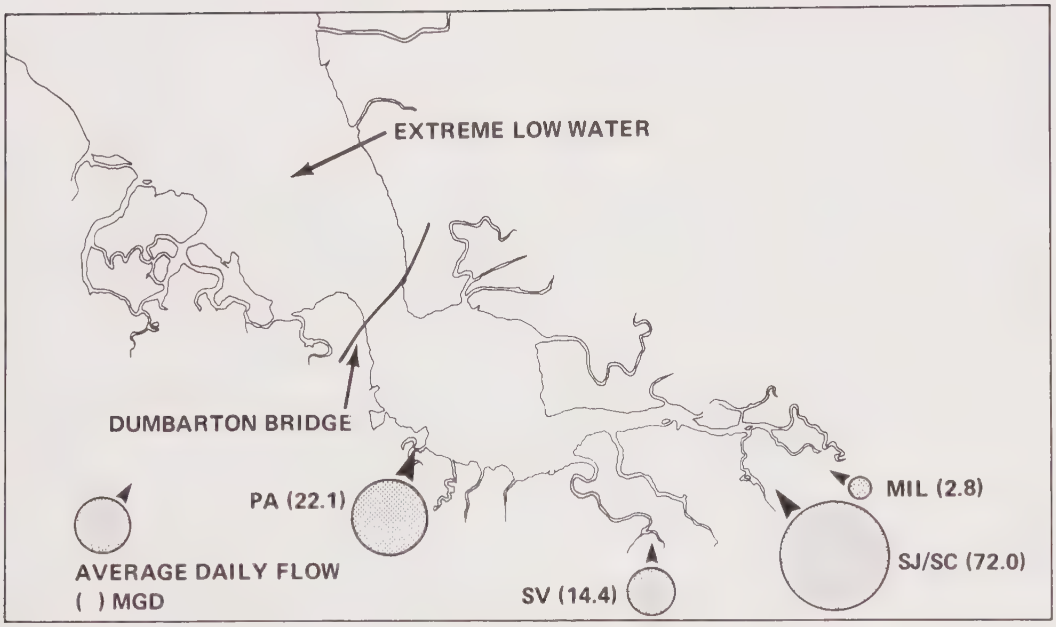


Figure 16-1. Discharge of Treated Wastewater by Members of the South Bay Dischargers Authority, 1970

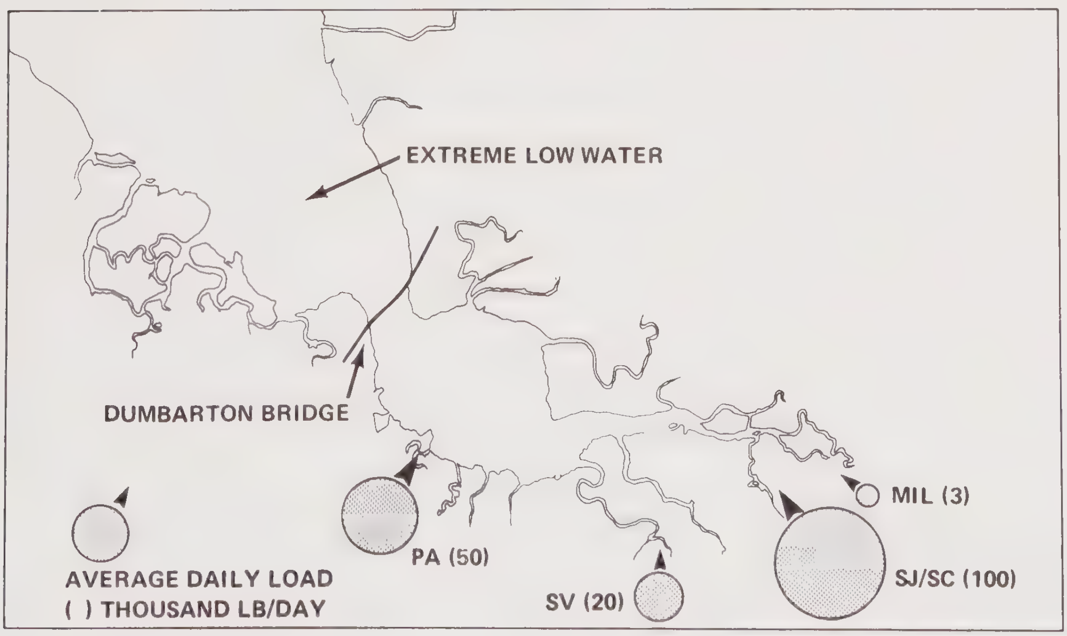


Figure 16-2. Discharge of Ultimate Oxygen Demand by Members of the South Bay Dischargers Authority, 1970

Existing facilities include: screening, grit removal, primary and secondary sedimentation, aeration, digestion, sludge concentration, sludge lagoons, chlorination facilities, and sludge disposal facilities. The existing San Jose/Santa Clara treatment plant has complete primary and secondary treatment facilities and consistently achieves a BOD removal of 90 percent.

An expansion of the plant facilities to an average hydraulic capacity of 160 mgd is presently under construction and is to be completed in late 1973. The additional plant facilities are those required to provide primary and secondary treatment for the sustained seasonal flow and to handle the peak wet weather flow rates of 340 mgd expected in 1985.

New units included in the current construction program are: additional screens, grit removal tanks, primary settling tanks, aeration tanks, final sedimentation tanks, and new nitrification tanks. Per capita flows and loadings for the San Jose/Santa Clara treatment plant are as follows:

	Yearly Average	Cannery Non-Season Average	Average Contribution by Cannery (July-Aug)
Average Flow in gpcd[a]	114.3	96.4	17.9
Influent BOD, ppcd[b]	0.461	0.267	0.194
Influent Suspended Solids, ppcd	0.479	0.357	0.122

a. gpcd-gallons per capita day
b. ppcd-pounds per capita day

Planned facilities to be added include: additional settling capacity and nitrification, dual media filtration, vacuum filtration and sludge incineration.

Expected effluent characteristics from the planned 1985 facilities include a BOD of 15 mg/l, suspended solids of 5 mg/l, ammonia of 0.5 mg/l as N, and a total oxygen demand of 40,000 lb/day.

16.1.2 Sunnyvale Wastewater Treatment Plant

The Sunnyvale treatment plant is a secondary facility with primary sedimentation tanks and oxidation ponds with aerators and recirculation, and a 200 million gallon holding pond for cannery wastes (1, 8). The plant can be operated to provide separate treatment of domestic and cannery waste. The plant is located at the north end of Borregas Avenue within the Baylands area on Sunnyvale Slough. Effluent is discharged into Guadalupe Slough. The plant presently has a primary treatment design capacity for an average dry-weather flow of 22.5 mgd.

The daily discharge of ultimate oxygen demand (UOD) is about 20,000 pounds (Figure 16-2). Effluent characteristics from the present facilities include: a BOD of 64 mg/l and suspended solids of 85 mg/l.

The 1970 average annual flow, exclusive of cannery wastes, was 14.4 mgd (Figure 16-1). During the canning season, an additional load of up to 9 mgd may occur. This waste is carried to the plant in a separate industrial waste sewer.

The present operating procedure is to treat domestic and cannery wastes separately through the primary stages. The two primary effluents are then mixed and conveyed to oxidation ponds for secondary biological treatment.

Facilities included in the plant improvement program now in the final planning stages are: additional primary sedimentation tanks, oxidation ponds, flotation units, filtration, and breakpoint chlorination for ammonia removal.

Per capita flows and loadings for the Sunnyvale treatment plant are shown in Table 16-1.

Table 16-1

PER CAPITA FLOWS AND LOADINGS
FOR THE SUNNYVALE TREATMENT PLANT

	Years 1968-1970		
	Overall Average	Maximum Monthly Average	Minimum Monthly Average
Domestic Flow gpcd	122.0	137.0 Feb	90.0 June
Industrial Flow mgd	2.54	6.98 Aug	0.86 Feb
Domestic plus Industrial Flow gpcd	146.3	199.4 Aug	111.6 June
Domestic Influent BOD ppcd	0.23	0.32 July	0.15 Sept
Industrial Influent BOD ppcd	13,400	91,100 Aug	1100 Feb
Domestic plus Industrial Influent BOD ppcd	0.35	1.30 Aug	0.16 June
Domestic Influent Suspended Solids ppcd	0.23	0.42 Nov	0.12 Aug
Industrial Influent Suspended Solids ppcd	4220	21,240 Aug	480 May
Domestic plus Industrial Influents Suspended	0.28	0.51 Aug	0.14 May

16.1.3 Palo Alto Regional Wastewater Treatment Plant

The City of Palo Alto is presently completing a regional treatment plant to provide secondary treatment to the wastes of Palo Alto, Mountain View, and Los Altos (1). This activated sludge plant also serves Stanford University, Barron Park, East Palo Alto Sanitary District, Los Altos Hills, Moffett Field, and Las Encinas Sanitary District. Design capacity is 35 mgd while the average dry weather flow is 22.1 mgd (Figure 16-1). The daily discharge of ultimate oxygen demand (UOD) is about 30,000 pounds (Figure 16-2). The average flow rate in 1970 was 121.8 gpcd, with monthly average extremes of 138.2 gpcd in January and 100.2 gpcd in October. The average influent BOD in pounds per capita per day in 1970 was 0.31, with monthly average extremes of 0.35 in October and 0.28 in March. The average influent suspended solids in pounds per capita per day in 1970 was 0.15, with monthly average extremes of 0.19 in April and 0.14 in September.

The plant is located on Embarcadero Road across from the Palo Alto Airport adjacent to the existing City of Palo Alto plant site. The discharge is to an unnamed mud flat channel about 1,500 feet out into the Bay, north of the Palo Alto Airport.

The Palo Alto regional treatment plant is designed for an overall BOD removal of 90 percent with an anticipated effluent concentration of less than 10 mg/l BOD and suspended solids. Facilities, upon completion of this current construction program in 1973, will include an influent pumping station, additional bar screens, primary and final clarifiers, aeration tanks, digesters, thickeners, and chlorination facilities. Sludge disposal

will be by centrifugal dewatering followed by incineration in two multiple hearth furnaces. Additional facilities will include an emergency bypass line to Mayfield Slough.

Filtration and nitrification is to be added in the near future. Studies are currently underway to determine whether it would be more economic to provide nitrification facilities at the Palo Alto plant, or to pay for increased nitrification at the San Jose/Santa Clara plant.

An additional feature of the Palo Alto regional plant is an industrial waste treatment facility, separate from the main plant. It treats chemical wastes such as acids, cyanides, and solvents brought to the facility in tank trucks.

16.1.4 Milpitas Sanitary District Wastewater Treatment Plant.

The Milpitas Sanitary District has approximately the same geographical limits as the City of Milpitas (1). Two plants occupy the site. The original was a trickling filter plant constructed in 1954 which was later expanded to a capacity of 1.3 mgd in 1963. In 1966, a new activated sludge plant was constructed with a capacity of 3.8 mgd. The original plant was abandoned. Since then, the original plant has been reactivated and derated to 0.7 mgd to provide a total capacity of 4.5 mgd.

Average daily flow to the plant in 1969 was 2.7 mgd (Figure 16-1). Of this, 63 percent was domestic sewage and the remainder industrial waste. Most of the industrial waste comes from the Ford Motor Company assembly plant. Average influent BOD in 1970, in pounds per capita day, was 0.19.

The daily discharge of ultimate oxygen demand (UOD) is about 3000 pounds (Figure 16-2).

The effluent is presently discharged through a clarification pond into Coyote Creek.

Future plans call for closing down the Milpitas plant in 1974 and conveying the raw wastewater to the San Jose/Santa Clara plant. An agreement to achieve this consolidation was reached between the Cities on July 10, 1973.

16.2 EXISTING AND PLANNED PUBLIC AND PRIVATE DEVELOPMENTS

The Sunnyvale and Palo Alto wastewater treatment plants are adjacent to future Baylands park areas, while the San Jose/Santa Clara plant is in a less sensitive area. The conveyance pipeline may pass through highly sensitive Baylands property. It is therefore necessary to identify these areas and the existing and planned public and private facilities in the Baylands that may be impacted by the Proposed Program.

The general plans of the various jurisdictions in theBaylands have been examined and the composite land-use zoning pattern shows a wide discrepancy between them as well as between the land use zones and the practical adaptability of some of the land for uses permitted in the prevailing zoning districts. Few of the zoning ordinances in the County and its cities make provision for land use districts or zones applicable to water or inundated areas, or for flood plain zoning. This includes the identification of areas of San Francisco Bay, inundated areas, and areas subject to flooding along the Bay, to provide for uses appropriate to such lands in the interests of the ecology of the area and in the interests of protecting persons and property fromhazards of development in such areas, and to protect the community from the costs which might be incurred if unsuitable development were to occur. Permitted uses would be water- and wetland-related, ranging from recreational uses to salt extraction.

Such a flood plain zoning provision would more nearly reflect present realities and future policies and practicalities of use. Working within the framework and the available land use plans from various jurisdictions, the composite land use plan shown in Figure 4-5 was developed (9-23).

As stated previously, this section will identify those areas and the existing and planned public and private facilities that may be impacted by the Proposed Program (Figure 4-5 and 4-6).

16.2.1 Santa Clara County

Only a small portion of the Baylands is not incorporated into one of the six municipalities in the study area, defined as that portion of Santa Clara County lying between an elevation of 10 feet above mean sea level (MSL) and the shoreline, and extending from Coyote Creek near Milpitas on the east to San Francisquito Creek in Palo Alto on the west (13). Unincorporated areas consist of the salt ponds and open water north of Mountain View, Moffett Field, and miscellaneous parcels in the uplant areas inside the limits of Mountain View, Santa Clara, San Jose, and Milpitas (15).

The Bayfront Plan of the County of Santa Clara (13) proposed that the innermost levees, between the salt ponds and the mainland be raised and widened to an average width of one thousand feet. Vehicular access was proposed to points along the edge by similarly widening certain levees along the flood channels leading from the valley floor to the Bay. The raising and widening of the land barrier was proposed to be accomplished by the dredging of existing channels and the Bay floor beyond the low water tidal flats in the amount of approximately 30 million cubic yards. The Bayfront Plan was opposed by many groups and was not approved by the Board of Supervisors.

In June 1971 a revised Preliminary Plan of Regional Parks for Santa Clara County was published by the County Planning Department. Developed cooperatively with the Parks and Recreation Department and two subcommittees of the Planning Policy Committee, the plan provided for the acquisition and development of five Baylands sites: Charleston Slough area; Salt Pond No. 1 east of Charleston Slough; the easternmost portion of the Sunnyvale Baylands Park area in Santa Clara and near Alviso; the eastern portion of the New Chicago Marsh; and, the northerly portions of the Coyote Creek Park chain.

Dedication of the Baylands for park purposes provides for public control and management over the ecologically valuable but fragile bayfront, meadows, marshes and shoreline for the public welfare and allows recreation and other uses. A recent public awareness of the delicate, but vital, ecological importance of the Baylands and related mudflats and waters has led to reexamination of past policies and goals for the Baylands. Therefore, the current emphasis is upon retention and preservation of the natural areas remaining in the Baylands, and allowing recreation activities only when they are compatible with higher priority conservation goals (12).

16.2.2 City of Milpitas

At the eastern edge of the Baylands study area is the City of Milpitas (15). It is a growing industrial center whose automobile assembly plant and other activities are served by two railroads.

From the Nimitz Freeway west to Coyote Creek, an area susceptible to flooding, the primary land use is agricultural (19). To the north, near Dixon Road, is the City's sewage treatment plant which occupies a six-acre site, protected by high levees. All zoning is agricultural. East of the Nimitz Freeway there are low density residential developments in the vicinity of the Calaveras Boulevard interchange.

The agricultural land between the Nimitz Freeway and Coyote Creek, north of the Calaveras Boulevard interchange, is classified as industrial. The area fronting Coyote Creek below the interchange remains designated as an urban reserve. The City plans to discontinue its wastewater treatment plant and convey its raw wastewater to the San Jose/Santa Clara plant.

16.2.3 City of San Jose

San Jose occupies the largest portion of the Baylands in Santa Clara County, subsequent to the consolidation of Alviso. The salt ponds, marshes and sloughs, from Guadalupe Slough on the west to Coyote Creek on the east, fall within the current City boundary(15).

Plans are being made for: (1) the establishment of a Mexican-American cultural center; 2) the creation of a special Marine District for water related industrial and commercial activities; and, 3) the "Alviso Bay" project, which includes the development of the salt ponds in the area between Alviso and Guadalupe Sloughs for recreational purposes (15, 20).

The most Bayward part of the salt ponds between Guadalupe and Alviso Sloughs is privately owned and is being deeded over a period of time to the Nature Conservancy. The parcel has a freshwater well and a duck-hunting club house.

Northeast of Alviso is the New Chicago Marsh, a diked-off area adjacent to the salt ponds, which receives tidal circulation at only a few places. A new railroad spur line was recently built through it to provide chemical delivery service for the San Jose/Santa Clara sewage treatment facility (24). The main Southern Pacific Railroad line from the East Bay crosses the salt ponds, skirts the edge of the marsh, and passes through Alviso.

The New Chicago Marsh has been platted for many years and is in mixed public and small private ownership, though less than half of the originally planned subdivision is developed (21, 22). The entire area is zoned residential. The San Jose/Santa Clara sewage plant site and most of the adjacent lands are owned by the City.

Newby Island lies between the main and the southeast branches of Coyote Creek. It is owned by a private company and is currently used as the San Jose refuse dump. The zoning classification of Newby Island permits multiple-family residential use.

16.2.4 City of Santa Clara

The Baylands portion of the City boundaries follows Route 237 between Calabazas Creek and the Guadalupe River. Agricultural uses are continuing here, although industries have begun to locate in this area. A municipal refuse dump is located off Lafayette Street and the Santa Clara Alviso Road. Present zoning is mixed between public facilities and agricultural classifications. Land fill has been used in a few developed areas near Route 237 which are subject to salt water flooding or fresh water inundation. The primary urban development within the City is located further south along the Guadalupe River, near Agnews State Hospital (15).

The general plan adopted by the City in 1970 (18) allocates the Baylands area primarily to industrial uses, with some residential uses south of Route 237 (15). A park area bordering the Guadalupe River and Route 237 — the Santa Clara County Valley Floor Park — is indicated in the General Plan. Because of current development proposals on a portion of this site, present attitudes of City officials are tending to favor industrial use of this land. The park remains in the County park program, but on a long-term basis. A 1968 study report for the park envisioned a dual purpose recreational lake and local drainage basin.

16.2.5 City of Sunnyvale

Land between the new Mountain View-Alviso Freeway (Route 237) and the salt ponds is changing from agricultural use to industrial use, in conformance with its zoning classification (15, 23). On the west, the Lockheed Missiles and Space Company has intensively developed a sizeable portion of its site. Adjacent to this is Moffett Industrial Park where facilities for industrial tenants have been developed.

Portions of the city on either side of Route 237 are susceptible to salt water flooding.

The City has a refuse fill in operation at the inboard edge (landward) of the salt ponds near the sewage treatment plant. Two former salt ponds outboard of the Lockheed property are now owned by the City and used as oxidation ponds for sewage treatment.

Within the city limits is a large area of Leslie salt ponds outboard (bay ward) of Moffett Field and smaller holdings in the open water with ownership claimed by both the Ideal Cement Company and the State.

Moffett Channel, a drainage ditch running from the airfield to Guadalupe Slough, has recently been improved by Lockheed along the portion of the channel fronting its property. The improvements include raising the south levee elevation along Moffett Channel and the creation of a small storm water retention basin. A pump station was also installed with a pipeline from the retention basin parallel to the south levee and discharging into Sunnyvale West Channel near its intersection with Moffett Channel.

Development in the salt ponds is under a moratorium and no intensive use of the area is contemplated at this time. The Shoreline Freeway, once a part of the State freeway plan, was included in the 1963 General Plan (23) but is no longer regarded as part of current anticipations or policies, although it has not yet been officially rescinded.

The 135-acre refuse fill area near the salt ponds is planned for park use (Sunnyvale Baylands Park) and the City intends a joint development program with the County.

16.2.6 Moffett Naval Air Station and Ames Research Center

Two agencies of federal government own the unincorporated area between Mountain View and Sunnyvale: 1) the Navy Department, and 2) the National Aeronautic and Space Agency (NASA) (15).

The Navy operates the Moffett Naval Air Station which is dominated by a 9,200-foot runway and hangars. Personnel offices and quarters also occupy the southern part of the site. A golf course lies to the northeast, bordering the salt ponds. At the bayward end of the runway, which is susceptible to salt water flooding, is a diked marsh, and beyond the marsh are salt ponds located partly within the city limits of Sunnyvale and partly in an unincorporated area.

The NASA Ames Research Center consists of over 40 wind tunnels and related research equipment and offices.

Most of the development is in the southern end of the site, though a new magnetism research facility occupies a northerly site location, near the diked marsh area outboard of the Moffett runway. The diked marsh area bordering the north end of both the NASA and the Moffett sites lies below mean sea level. It has no drainage system and consequently ponds rainwater. A large portion of the site adjacent to Stevens Creek is leased for agricultural use at present, but will be the site of a large new wind tunnel, large enough to take a full-size Boeing 747.

The Navy intends to continue current levels of operation at least to 1980, though no major changes in facilities or land use are foreseen. Flight clearance requirements for the runway impose constraints on future change of use or development in the salt ponds outboard of the runway.

NASA is in the process of acquiring adjacent parcels for an anticipated major expansion to the north and west, although there is still some uncertainty about these plans. A 1968 master plan is used to guide this development and includes a drainage system in the northernmost part of the site where the two magnetic research facilities are located and a pond where cooling tower waters could be treated before discharge into Stevens Creek.

16.2.7 City of Mountain View

The area adjacent to the Bayshore Freeway, between Charleston Slough and Stevens Creek, is in private urban uses (15). Agricultural uses with deteriorating semi-rural residences occupy the intermediate lands between the Bayshore Freeway and the salt ponds. The area bayward of Charleston Road is susceptible to salt water flooding. The northern city limit bounds a 550-acre regional park development now under way on City-owned property.

The salt ponds north of this park development, part of the Leslie Salt Company holdings, are in unincorporated county land which has an agricultural zoning classification. The open waters beyond the salt ponds are claimed partly by the Ideal Cement Company and partly by the State.

The City's sewage disposal facility occupied a site at the southern-most tip of Mountain View Slough. This plant was converted in the fall of 1972 to a pump station to divert Mountain View sewage flows to the Palo Alto wastewater treatment plant south of Palo Alto Yacht Harbor.

The Mountain View Shoreline Park area, acquired jointly by Mountain View and Santa Clara County, is currently under development in a former marshland area. Refuse from San Francisco is being used to fill this area utilizing the sanitary landfill technique. The Baylands park will cover about 550 acres. The plans included an 18 hole golf course, recreation center, amusement center, lakes and open space meadow areas (24).

The scheduled completion date for the regional park land fill is in the late 1970's.

The remaining 850 acres between the park and the Bayshore Freeway have been under planning review by the Environmental Planning Commission of the City of Mountain View. Although the two salt ponds north of the regional park are not presently within the city limits they are within the City's sphere of influence. The Mountain View General Plan (1, 11) provides that the Bay and the salt ponds remain indefinitely in open, undeveloped water uses.

16.2.8 City of Palo Alto

Most of the Baylands in Palo Alto are owned by the City itself and consist of 3,900 acres between San Francisquito Creek and Charleston Slough. These acres are susceptible to salt water flooding.

The Santa Clara County Flood Control and Water District maintains a 600 acre flood retention basin between Mayfield Slough and Charleston Slough. This basin, since its removal from tidal action, has become a brackish wildlife area and is principally dry grassland during most of the year. It is designated by the City of Palo Alto as the Palo Alto Marshland Preserve (1). Its primary use is as a flood control facility, but its use as a wetland and wildlife habitat sanctuary is of major importance (12). It is one of the few remnants left of relatively undisturbed wetland in the Bay Area. Recreation uses here may include hiking, nature walks, and retriever dog training in limited areas. The present plant community provides a permanent habitat and nesting area for several species of waterfowl, shore birds, and mammals, and wintering or resting grounds for many migratory waterfowl and shorebird species which complement the adjoining tidal marsh plant community. The Flood Basin will be converted to wildlife preserve by the City of Palo Alto by selective dredging to create island sanctuaries and mounds and by the introduction of compatible salt-tolerant plants to increase the habitat diversity and

food supply and variety. This will allow greater use of the wetlands by each species and encourage other species to inhabit the basin.

The Shoreline Regional Park Plan, (25) developed by the County Parks and Recreation Department as the Three Finger Lakes Plan, would utilize the Palo Alto flood retention basin plus the two adjacent salt ponds north of Mountain View for combined flood control and recreational uses (1).

Adjacent to the flood retention basin is a one-acre pond with related sanctuary zone. The pond attracts migratory waterfowl, as well as indigenous waterfowl and shorebirds. Associated with it is a 13-acre lagoon, formerly a portion of a slough (Mayfield Slough), which was the estuary of San Francisquito Creek. Previously closed to tidal action, the lagoon, which has stagnated, will now be open to tidal action as a salt marsh demonstration project with the goal of reestablishing the natural ecology of the slough. The duck pond and lagoon are heavily visited by residents throughout the year, but particularly in the winter months when hundreds of migratory waterfowl winter here.

Adjacent to, and east of, the Palo Alto Flood Retention Basin is Charleston Slough (12). It is owned by Leslie Salt Company and provides an intake for the solar evaporation system by which salt is extracted from the Bay. It consists of approximately 190 acres and is a valuable wildlife habitat area that is not open to the public. In Mountain View, east of Charleston Slough, are two salt ponds and a wet meadow. The salt ponds remain in the Shoreline Park Proposal (12, 25), and have been supported by the Santa Clara County Planning Committee (13, 14, 16) as possible sailing basins if discontinued for salt production.

The northwest areas occupied by the airport and yacht harbor are leased to Santa Clara County, which built and maintains these facilities. The Palo Alto Airport, adjacent to the golf course, is a major general aviation

facility. Ancillary to the airport function are unoccupied clear zones at the ends of the runway.

Presently there are approximately 120 berths in the yacht harbor and with the expansion there will be 400 berths. The ability to both dredge and to provide the facilities for expansion is largely contingent upon the availability of a site for the disposal of dredged spoil and the availability of County funds. Dredging is done within the yacht harbor lease lines and is currently needed to maintain operation.

The Palo Alto water pollution control plant is located just south of the yacht harbor (15). To the east of this plant is the municipal refuse area, which is the only area of the City's Baylands above 10-foot elevation. The sanitary landfill site of 150 acres is presently estimated to be filled by 1983 (12). If this area is still needed for refuse disposal, another layer of 10 to 20 feet could be added which would take care of the disposal needs of the City until the year 2000. This land has been dedicated as a public park but specific uses have not been assigned. A golf course has been suggested as one major use.

An International Telephone and Telegraph Company (ITT) receiving network occupies an area of 154 acres of land between the refuse area and the Bayshore Freeway. The area is unincorporated and is entirely surrounded by the City of Palo Alto (15). All of the above areas are surrounded by a perimeter levee, portions of which have been built and maintained by the Flood Control and Water District (12).

San Francisquito Creek, a flood control channel, is bordered by the Municipal Golf Course in the Palo Alto Baylands, and by the Faber Tract across the channel in San Mateo County (15). Both the Faber and Laumeister Tracts, which the City owns, have been designated as Marshland Preserve (12) as have other parcels of Marshland with the Palo Alto

city limits. The 120-acre Laumeister Tract is an undisturbed marsh, while the 100-acre Faber Tract (once diked and used for grazing) is now open to tidal action, and, without reseeding, the salt marsh is re-establishing itself. Inboard of the Municipal Golf Course, the Faber Tract, and San Francisquito Creek, the area is fully urbanized.

Hooks Island is a 35-acre island of cordgrass salt marsh that it completely inundated by the tides. The Sand Point Marsh is the major marsh of 120 acres in Palo Alto's Baylands and is composed of cordgrass, pickleweed and salt grass, successively, from its lowest to highest elevations.

Sand Point Marsh is important ecologically, particularly for its food value, wildlife habitat and reoxygenation. Two endangered species, the California clapper rail and the salt marsh harvest mouse, as well as other rare and threatened species, inhabit the marsh.

A 60-acre marshland, located north of the west abutment of the existing Dumbarton Bridge, is presently being utilized as a duck club (26). This salt marsh is diked off from the Bay and is not exposed to tidal fluctuation (26). The marsh remains dry for most of the year until duck season begins, then the marsh is filled with fresh water. The fresh water lures migrating ducks for resting and feeding. This marsh area is part of the future National Wildlife Refuge and is proposed as a site for a miniature interpretive center to serve the local west Bay communities.

The Peninsula Sportsman Club is a very active skeetshooting range with seven target launching huts (26). The Club is located about 3/4 mile northeast from the end of University Avenue, adjacent to the north side of the Hetch Hetchy pipelines and south of a salt pond.

The open water area outboard of the Bay shoreline is zoned by the City as a flood area (15). Ownership is claimed by the Ideal Cement Company, although the title status may be subject to dispute by the State.

The City's 1964 general plan (27) is presently undergoing revision, but the basic concepts pertaining to recreation, city facilities and some urban uses in the Baylands apparently continue. The ITT property may be sold and developed — as urbanized recreation — though no specific plan is associated either with it or with the adjacent city-owned area now being filled with refuse.

There are four industrial areas north of the Palo Alto airport, east of the Bayshore freeway and south of the existing approach to the Dumbarton Bridge as follows: (1) auto wrecking yards, (2) KIBE radio facilities, (3) the Bay Road industrial area, and (4) Cooley Landing (9).

The Bay Road Industrial Area is generally located around Bay Road between Clarke Avenue and Maple Street including Demeter Street and Tara Street and the northern portion of Pulgas Avenue.

Cooley Landing is located on a peninsula jutting into San Francisco Bay from East Palo Alto at the end of Bay Road in the city limits of Menlo Park (26), Most of the landing is owned by a ship repair facility. The owner is planning a modern aquatic park and yacht harbor.

The Cooley Landing Transmission Substation is located just south of the Bay Road near Cooley Landing and adjacent to the Baylands (26). The substation is located on a triangular parcel of land 6.5 acres of which 2.5 acres are used for electrical transmission. The main PG&E power lines run south from the Ravenswood Substation and pass through two salt ponds between the Dumbarton Bridge west approach road and Bay

Road at Cooley Landing. To the south of Cooley Landing, the main lines are at the edge of the Baylands. At Cooley Landing a portion of the main high voltage wires run west into the Cooley Landing Substation. From the Substation, there is a single line of towers with high voltage lines which run adjacent to the dike which separates East Palo Alto from the Baylands and the Palo Alto Golf Course.

The existing Southern Pacific Railroad Bridge is approximately 3,800 feet south of the Dumbarton Bridge (26). The single track bridge consists of steel truss sections with a swing span over the shipping channel. The west approach goes through marshland which has been partially filled and developed.

The KIBE radio station has a transmission tower located 1300 feet east from the end of University Avenue and 220 feet north of the Southern Pacific Railroad tracks (26).

16.2.9 Leslie Salt Company

The Leslie Salt Company, founded in 1919, and incorporated in 1936, is the largest single property owner in the Baylands study area, having a total of 8,700 acres of which 7,700 acres are in salt ponds (15). These comprise a small but key portion of its San Francisco Bay holdings in four counties, totalling close to 50,000 acres.

The system of salt production ponds within the study area runs between Charleston Slough and Newby Island. The complete salt pond system extends from Charleston Slough in the Santa Clara Baylands in Newark in Alameda County.

Salt water from the Bay is taken in at Charleston Slough at a point between the Stevens Creek outfall and Guadalupe Slough, and at Alviso Slough. The salt water is allowed to evaporate in the ponds, and is pumped across sloughs or under dikes in an easterly direction to successively more saline ponds (a series of salt concentrating ponds). The salt is then run into a final concentrating pond, called a "pickle pond," which contains ten percent of the volume of the sea water taken in from the Bay.

The evaporation process takes about five years and yields approximately 40 tons of nearly pure salt per acre per year, averaged over the total pond system.

The Baylands salt ponds, especially the less salty ones, are used by migratory wildlife species for resting places and for some food supply, since brine shrimp and other organisms grow in the various stages of pond salinity (28). Very little public access occurs along the levees and shoreline in the salt pond areas because the Company maintains a controlled access policy.

16.2.10 National Wildlife Refuge

Fostered by the ad hoc South San Francisco Baylands Planning, Conservation, and National Wildlife Refuge Committee, studied by the Bureau of Outdoor Recreation and the Bureau of Sport Fisheries and Wildlife, and supported by the Department of Interior in congressional hearings on bills to establish it, the San Francisco Bay National Wildlife Refuge received congressional approval in the spring of 1972 and the legislation was signed by the President on June 30, 1972. Primary funds for acquisition and development will come from the Migratory Bird Conservation ("duck stamp") Fund, and the Land and Water Conservation Funds for endangered species.

The refuge is located in three counties: Alameda, San Mateo, and Santa Clara; and in the cities of Fremont, Redwood City, Menlo Park, and San Jose. It traverses five habitat types in the South San Francisco Bay area, as follows: salt ponds, mud flats, open water, marshlands, and grasslands. The portion in Santa Clara County extends from the Alviso Slough eastward, including all of the salt ponds and the portion of the New Chicago Marsh east of the new railroad spur, and is approximately 3,000 acres in extent. In support of the refuge, the San Jose City Council reclassified the zoning of the area from industrial to agricultural, its most restrictive use-district classification.

Leaseback privileges to Leslie Salt Company, to permit continued salt production, are envisioned. Past curtailment of salt production elsewhere on San Francisco Bay, and the draining and subsequent filling of other salt ponds for commercial and residential development has contributed, in part, to the widespread support of the wildlife refuge concept. There are three primary objectives of the refuge. The first is to preserve and maintain fish and wildlife habitat necessary to support sizable populations of migratory waterfowl and other migratory birds, indigenous flora and fauna, and endangered species of wildlife. The second is to provide and protect unique fish and wildlife areas for human use and enjoyment. The third is to maintain open space, open water, and marsh and tidal mudflats uniquely situated in the heart of a metropolitan area, all of which are considered to be beneficial to man's health and welfare.

The Alviso unit of the refuge is intended to include an interpretive and education center, a wildlife trail, board walks, a wildlife observatory and fishing platforms along channels. Overwater blinds for hunters would be provided for limited public hunting.

Establishment of this wildlife refuge constitutes a major land use decision with the consequent need for flood control measures.

16.2.11 Hetch-Hetchy Aqueduct

The Hetch-Hetchy aqueduct crosses San Francisco Bay just to the north of the Southern Pacific Railroad Bridge. This aqueduct supplies San Francisco and most of the Peninsula with water (26). The aqueduct is located about 3,000 feet south of the Dumbarton Bridge, and consists of: an over-water steel truss section, 4,000 feet long; an underwater section in the Bay 2,750 feet long; a low-profile underwater section in the Newark Slough 400 feet long; and, the Dumbarton pump station.

After the pipes reach the west shoreline the pipes continue above ground for approximately a half mile. At a point approximately 800 feet from the point, where the proposed Embarcadero connection crosses the Southern Pacific Railroad tracks, the pipes go underground.

16.2.12 Dumbarton Bridge

The proposed Dumbarton Bridge replacement project consists of improving Route 84 between Route 17 in Alameda County and Route 101 in San Mateo County by replacing the existing two-lane low level bridge with a four-lane high level bridge; widening and realigning the east and west approaches; constructing a new toll plaza; constructing a new easterly connection to Route 17; and constructing and/or improving one or more westerly connections to Route 101 (26).

The existing west approach road to the Dumbarton Bridge is built on fill which traverses through or adjacent to the salt ponds. The west approach road is built over timber culverts, equipped with movable gates, which connect the salt ponds on each side of the roadway and are used for moving the salt water into salt ponds with a higher salt concentration.

16.3 PHYSICAL ENVIRONMENT

16.3.1 Geology

San Francisco Bay is located in the central coastal section of the Coast Range Province which is delineated by a series of north-northwest trending mountain ranges and intermountain valleys and bounded on the east by the Central Valley and on the west by the Pacific Ocean. The Bay lies in a northwesterly trending depression bounded on the west by the low hills of the San Francisco and Marin Peninsulas and on the east by a low plain gently sloping up to the base of the northwest trending Berkeley Hills. (26)

The major structural features of the San Francisco Bay Region are the San Andreas Fault Zone to the west of the Bay and the Hayward Fault Zone to the east (Figure 4-9). The San Andreas Fault is a principal structural feature of California and is traceable for over 500 miles. The San Andreas Fault Zone is seismically active and has been the locus of a number of severe earthquakes.

The Hayward Fault Zone is located east of the Bay and west of the base of the Berkeley Hills. The fault zone is seismically active, and measurable "creep" has been reported along the fault trace.

The baylands of Santa Clara County are comprised of the sloughs, marshes and lowlands at the northerly end of the Santa Clara Valley and the southerly end of San Francisco Bay (15). The Bay here is generally shallow, having water depths averaging less than 10 feet in the study area.

The Baylands areas is underlain by deep deposits of alluvial sediments. This alluvium is exposed over most of the southern portion of the Baylands, and consists of lenticular alluvial deposits of sands, gravels, silts, and clays. The sand and gravel deposits generally vary in density from loose to medium.

In the tidal portions of the Bay, the deeper alluvium is generally overlain by soft deposits of silty clay, known as "Bay mud." The Bay mud also overlies the alluvium in the area occupied by salt ponds and marshland and ranges from a thickness of a few feet at the southern shoreline of San Francisco Bay to about 30 feet along the submerged channel of Coyote Creek.

The bedrock floor lies at depths ranging from 600 to 2,400 feet beneath the Baylands. Possible fault features in the bedrock below the Baylands are roughly parallel to both the San Andreas and Hayward fault systems and lay between them. In the event of a future large earthquake on the San Andreas or Hayward faults, there is the possibility that sympathetic movement might occur on the subparallel faults lying beneath the Baylands.

Applied loads of structures or fills could subject the soft clay soils and loose sand and silt deposits in the Baylands to localized settlement. Localized settlement occurs primarily because of densification of the shallow soils under applied loads, and is usually confined to the immediate vicinity of the structure or loading.

Subsidence is characterized by a reduction in the ground surface elevation over large areas. The subsidence experienced in Santa Clara Valley is due to the withdrawal of groundwater from deep aquifers and has resulted in consolidation of the clay layers adjacent to these aquifers as the groundwater level is lowered by pumping from wells. This generally would not present a hazard to structures contemplated in the Proposed Program, except that much of the project area — all of the salt ponds and a fringe of dry land including part of the community of Alviso — has subsided below sea level and is susceptible to salt water flooding in the event of failure of the existing levees. The stability of these levees during a strong earthquake is questionable.

16.3.2 Air Quality

The weather and the amount of air pollutants in the Bay area is determined by an interplay of high and low pressure areas, and the continental and maritime air masses. The continental air mass, centered over the Great Basin, is cold and dry in the winter and warm and dry in the summer. The Pacific air mass is more moist, denser and varies over a small temperature range. These two air masses are constantly moving back and forth across the area, with one being dominant for a time, then the other, thereby creating the Bay area weather.

The amount of air available to dilute pollutants depends upon several factors in the region's overall weather pattern, primarily the character of the inversion layer and the amount of wind flow. The inversion layer is a blanket of air warmer than the air immediately below it, thus a reversal of the normal decrease of temperature with altitude.

In terms of air pollution, the most important effect of a temperature inversion is its ability to act as a barrier to prevent pollutants from rising and being diluted vertically. When the inversion layer is lower than the hills surrounding the Bay it becomes a lid sealing the low-lying, pollution-bearing air into the Bay area basin.

The mean monthly temperature for the Santa Clara area, ranges from 48°F to 68°F.

Northwesterly winds predominate from April to October in the Santa Clara Valley. A diurnal wind pattern exists. Southeasterly and northwesterly winds occur with about the same frequency between November and March. Although the strongest winds occur during winter, the average winter wind speed is less than for summer.

Since most of the storms occur between November and April, most of the rainfall is received during this period. Mean monthly rainfall for Santa Clara County ranges from a trace to 2.87 inches with a yearly total of 14 inches (4).

The yearly ranges of pollutants in the San Jose area, which is somewhat typical of the project area, are: oxidants, 0.02-0.10 ppm; CO, 4-10; oxides of nitrogen, 0.08-0.31 ppm; and hydrocarbons, 4-8 ppm [4].

16.3.3 Hydrology

16.3.3.1 Water Sources. There are five important sources of water in Santa Clara County: 1) local surface runoff; 2) groundwater; 3) raw (untreated) water imported through the South Bay Aqueduct; 4) water from the South Bay Aqueduct treated at the Rinconada Water Treatment Plant of the Santa Clara Valley Water District; and, 5) water imported by the San Francisco Water Department.

16.3.3.2 Water Quality of the Bay. There are two tide cycles within the South Bay region. Tidal currents within the discharge location average 1.8 knots (3.06 ft/sec.) at maximum flood and 0.3 knots (0.51 ft/sec.) during maximum ebb. Even though the South Bay region may have moderate tidal currents, there is minimal flushing of water pollutants. This lack of an adequate flushing action is due partly to poor water circulation and no major inflows.

The chloride concentration drops gradually as one proceeds south toward the Dumbarton Bridge, and then drops sharply south of the bridge. Values in the southern end of the Bay range from 10,000 to 14,000 mg/l during the dry period and from 2,000 to 5,000 mg/l during the wet period.

Water temperature varies widely in the Bay over the year. Average temperature south of San Mateo Bridge is $16^{\circ}C$, with a range of about $\pm 8^{\circ}C$.

Biochemical oxygen demand (BOD) measures 0.4 to 3.0 mg/l between the San Mateo Bridge and the Dumbarton Bridge. BOD values south of Dumbarton Bridge increase greatly, and concentration varies according to tidal stage and loading rate from the South Bay discharges.

Benthic oxygen demand measurements indicate an average value of 1.0 gm O_2/sq m/day as representative of the area south of Dumbarton Bridge.

Maximum values for unoxidized nitrogen occur at the southern end of the Bay where levels range from 7.0 to 20 mg/l. Levels for ammonia nitrogen (included in unoxidized nitrogen) are 2.0 to 20.0 mg/l. The profiles for both parameters drop sharply to the level (0.1 to 0.5 mg/l) in the area of the discharge location near Dumbarton Bridge.

Nitrogen, phosphorus, and dissolved silica profiles are qualitatively very similar to those of unoxidized nitrogen and ammonia nitrogen. Maximum values of the three parameters occur at the southern end of the Bay, and concentrations are reduced toward Dumbarton Bridge and level off to a constant value north of Dumbarton Bridge. Values for total nitrogen (total unoxidized nitrogen plus nitrate nitrogen) average 22.0 mg/l at the lowest end of the Bay and drop to less than 1.0 mg/l between Dumbarton and San Mateo Bridges. Peak dissolved silica (reported as mg/l of SiO_2) in the South Bay is greater than 20.0 mg/l and in the order of 6.0 to 7.0 mg/l north of Dumbarton Bridge.

Maximum phosphorus values (mg/l soluble orthosphosphate) at Dumbarton Bridge are approximately 1.0 mg/l, with a peak at about 2.0 mg/l. The average value over the greater part of the South Bay is approximately 0.2 mg/l.

16.3.3.3 Groundwater. In the Santa Clara Valley the range of measurements, reported in mg/l, is as follows: calcium, 26-62; magnesium, 12-31; potassium, 0.2-1.6; silica reported as silica dioxide, 11-37; chlorides, 13-43; sulfates, 20-49; bicarbonates, 186-294; nitrates, 0.3-24; sodium, 18-78; and total dissolved solids, 263-395.

The water quality of the groundwater basin in Santa Clara County is shown in Figure 16-3, and Table 16-2.

16.3.3.4 Flood Control. That portion of the Baylands below an elevation of 10 feet above mean sea level runs a high salt water flood risk in the event of a major levee failure, thus limiting future development in the area.

16.3.4 Noise

Noise is associated with the operation of wastewater treatment facilities. The significance of the noise problem is related to the proximity of the noise producer to residential, recreational, and other areas. The noise generated could be significant since a yacht harbor and golf course is adjacent to the Palo Alto plant and a planned shoreline park is adjacent to the Sunnyvale plant.

Table 16-2

GROUNDWATER QUALITY IN SANTA CLARA COUNTY

Location* of Sample	Parameter (all units in mg/l)									
	Ca	Mg	K	SiO_2	Cl	SO_4	HCO_3	NO_3	Na	TDS
1	26	12	0.2	-	38	22	218	1.8	78	-
2	-	30	1.2	28	43	-	201	14	33	-
3	62.5	28	1.6	30	42	27	-	23.8	26	39
4	55	18.5	1.3	20	33	30	252	6.1	30	32
5	44	16	1.2	24	13	36	186	15	18	26
6	50	16	1.5	28	19	20	-	5	37	-
7	53	22.5	1.4	22	33	38	256	5.2	39	34
8	52	20	1.0	37	19	-	-	1.7	-	-
9	48	31	1.4	-	28	49	203	21.5	24	33
10	32.5	21.5	1.0	20	13	27	209	2.0	-	35
11	39	21	0.5	11	25	45	294	0.3	-	29

*See Figure 16-3 for location of sampling station

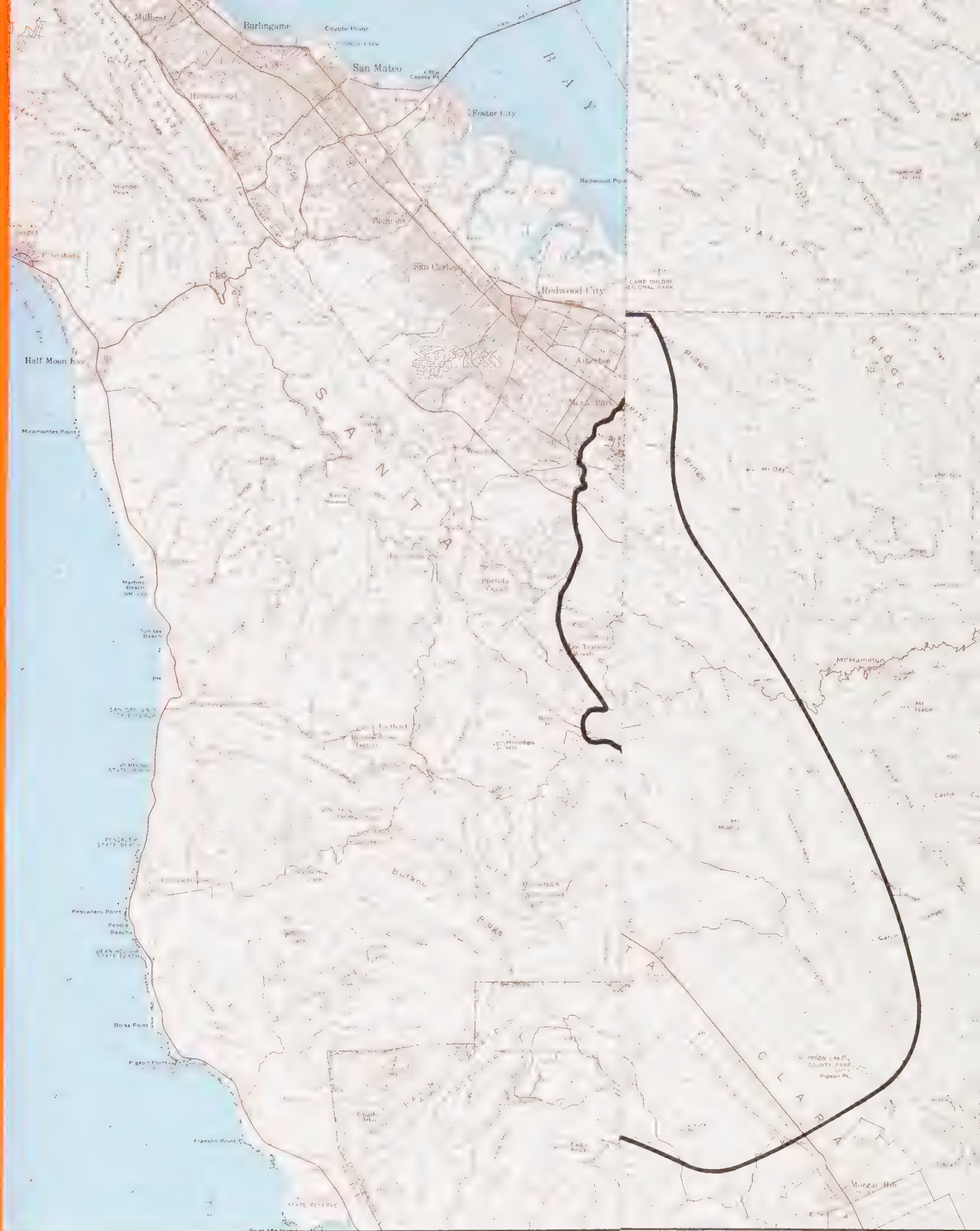
16.3.5 Resources

16.3.5.1 Mineral. Mineral resources of Santa Clara County are of three kinds: (a) those minerals used in the construction industry, limestone used in the manufacture of cement, and rock, sand, and gravel used for road base construction for concrete; (b) other minerals used in the manufacture of metal or other products; and (c) calcium chloride (salt) obtained from solar evaporation (29).

Valuable limestone deposits currently being mined for cement are found in the Kaiser Permanente quarries along the Monte Bello Ridge west of Cupertino. Rock suitable for road base construction is found throughout the mountain areas of the County. There are some deposits of medium-to-good quality diabase rock (including a sizeable deposit on County-owned property on Metcalf Road). High quality sand deposits usable for concrete are for the most part already depleted.

Of minerals in the second category, cinnabar, chromite, manganese, and magnesite are the most important. None of them, however, is currently valuable enough to be mined to any extent today.

The salt industry is centered around the San Francisco Bay and particularly in the South Bay area. Large tonnages of salt have been obtained at Newark by solar evaporation of salt water in salt ponds in northern Santa Clara County and southern Alameda County. Only a small part of the local salt is processed in the form of table salt. Much of the salt is shipped in bulk, raw, unrefined form to chemical industries, particularly in the Orient. Some knowledgeable people believe that with rising labor costs, taxes, and transportation costs, the salt evaporation process brings less and less monetary return to the producer. Should desalination of sea water become a significant process in California, it is expected that the great amount of salt produced, as a by-product, would mean an early cessation of the local solar salt operations.



: LOCATIONS OF GROUNDWATER SAMPLING STATIONS. SEE TABLE 16-2 FOR DATA

Figure 16-3
UNDWATER QUALITY
ANTA CLARA COUNTY

16.3.5.2 Agricultural. Before its intensive urbanization, the Santa Clara Valley offered outstanding food production resources (30). Its mild, sea modified climate, its long growing season, its rich, deep alluvial soil, its abundant water, its nearby markets, all combined to make it a high producing agricultural garden spot. It was ideal for the intensive irrigated production of pears, apricots, prunes, cherries, strawberries, vegetables, and other specialty crops. After World War II, agriculture lost a fierce competition with urban development. Subdivisions, shopping centers and other urban development have filled most of the north Valley floor, covering over some 200 square miles of high quality agricultural areas.

Aside from residual pockets of agriculture in the north Valley (chiefly in Berryessa and the North San Jose area), the south Valley is the last source of food producing soils in the Santa Clara Valley.

The climate of Santa Clara County is favorable for a variety of fruit and vegetable crops, premium wine grapes, cut flowers and nursery stock. However, all of these crops can also be grown as well or better in other competing areas of the state, and, in the case of fruit crops, these other areas generally attain higher yields per acre and times or conditions of maturity more favorable for maximum market return.

Approximately 150 cattle operations utilize about 250,000 acres of rangeland. Of these, 125 are full-time commercial operations. Limited acreages of improved or irrigated pasture are also used in livestock enterprises.

16.4 BIOLOGICAL ENVIRONMENT

The biological environment of the South Bay area is discussed in accordance with the type of biological habitat as follows: grasslands, salt ponds, sloughs, salt marshes, mud flats, and open water (Figure 4-7). These habitats extend in belts paralleling the Bay shoreline and are similar in character through the South Bay area.

16.4.1 Grasslands

Lands higher and drier than Bay marsh lands and flood control basins are termed grasslands, and these lands contribute to the scope and diversity of the South Bay environment. The grasslands provide refuge for Baylands wildlife during periods of high tide or flood and produce large amounts of food in the form of green leaves and seeds for many terrestrial species of wildlife.

Grasslands of the project are subject to high water levels, and vegetation species vary with existing salt content of the soils, salt content of standing water, level of underground water, and soil composition. A number of salt marsh species, salt tolerant species, and fresh water species have been reported from "upland meadows" in addition to the grasses, shrubs, and herbs typical of higher ground. These include sweet fennel, salt bush and curly-dock as well as gumplant, pickleweed, and coyote bush.

Bird species are characterized as seed-eaters and as raptors. A number of marsh birds such as egrets and herons may be found feeding in the upland meadows. One species unique to "upland meadows" is the burrowing owl, which depends on abandoned ground squirrel burrows for food and shelter.

Characteristic mammals include: black-tailed hare, the California ground squirrel, and the California meadow mouse.

16.4.2 Salt Ponds

A series of diked salt evaporator ponds owned by Leslie Salt Company forms a band of habitats of increasing salinity from Charleston Slough in the north to Coyote Creek in the south (Figure 4-6). These ponds are separated by a number of sloughs and channels (17). They provide a large surface area of open water which attracts wintering species of wildfowl in large numbers, and the variability in salinity provides diverse habitat for a number of estuarine organisms (31). Each pond has a certain assemblage of species characteristic.

of that salinity range. One of the most common species in salt ponds is the brine shrimp.

Levee banks and old dike islands provide an "edge effect" on increase in available habitat which permits a greater diversity of wildlife. Levees support salt marsh and salt tolerant species of plants, and stable nesting sites for large numbers of avocets, black-necked stilts, kildeer, and other shore birds. Some levees are high enough and wide enough to provide a grassland habitat and support terrestrial species in small numbers.

Power transmission line rights-of-way add another "edge effect" in providing attachment space on trestles for sessile (non-mobile) invertebrates and algae. Three miles of transmission lines with supportive trestles have been estimated to provide one acre of habitat for non-mobile forms (15). In addition, cross arms and tower girders have provided roosting sites for water birds such as pelicans and cormorants as well as habitat for terrestrial insects and other arthropods.

16.4.3 Sloughs

A number of tidal sloughs or creeks are characteristic of the South Bay area. These sloughs have a diversity of habitats, including open water which ranges from brackish to estuarine, tidal flats, and estuarine flats, and tidal vegetation or "eyebrows." A typical tidal slough is Guadalupe Slough, located near the Sunnyvale Treatment Plant oxidation ponds.

Open water in the sloughs is closely confined until a level below the ten-foot contour level. Limited numbers of fish such as striped bass, smelt, perch, and bottom fish forage in the sloughs. Some slough waters support small numbers of harbor seals, and large numbers of wading birds, and puddle ducks. Other water birds feed in the shallows of the larger sloughs.

Freshwater sloughs, such as Casey Slough which empties into Charleston Slough between the Cities of Palo Alto and Mountain View, support small populations of panfish, frogs, and other freshwater species. Very little open water is found as the water surfaces are covered with algae growths and "choked" with freshwater marsh vegetation.

Tidal mudflats support a variety of microorganisms and invertebrates. The flats grade into marsh and provide feeding grounds for marshlands species such as shorebirds and terrestrial species such as raccoons. At low tides, oxygen exchange is also carried on by algae typical of mudflats.

"Eyebrows" are those bands of vegetation that fringe the sloughs and grade from tidal flats to high marsh vegetation. Species zonation reflects the ebb and flow of the tides. Typical plant species range from inundation-tolerant species such as cord-grass on the water edge, to species typical of high tide inundation such as pickleweed, gum plant, or salt grass. High ground edges of coyote bush and grasses similar to those species found in upland meadows may be found on bordering levees and higher banks. Upstream of the slough mouth, less salt tolerant species are encountered and bullrush, tule, and cattails become dominant species.

Slough eyebrows provide the highest quality habitat for Baylands species throughout the year. The endangered salt-marsh harvest mouse resides in such habitats, and other rodents forage there at low tide (32). Predatory mammals breed and forage in this habitat, and slough tules provide nesting sites for blackbirds, coots, puddle ducks, and marsh wrens.

16.4.4. Salt Marshes

As salt tolerant seed plants are able to root within the softer muds fringing the South Bay, salt marshes form a very productive zone between mudflats

and drier lands. The South Bay area has a number of square miles of salt marshes. Much of the area adjacent to tidal sloughs and converted mudflats comprise the bulk of the marsh acreage (33).

Most estuarine life within the Bay depends directly on the salt marshes and mudflat plants for their sustenance, or indirectly depends upon them by feeding upon other estuarine life. Large numbers of birds including shorebirds, ducks, and geese come to the marshes to feed on the lush vegetation or on the brackish water animal life (34). Animal wastes, together with the decomposition products of plant decay, contribute nutrients to the marshes which are in turn distributed to the mudflats and the adjacent shallows of the Bay.

South Bay salt marshes may be conveniently subdivided into two flora and fauna associations. In the buffer area between the tidal mud flats and the higher tidelands there is a band of grey-green emergent vegetation. This vegetation is commonly referred to as "cord grass" (Spartina). Cord grass is a sod and marsh-building salt tolerant plant which can stand inundation but not dehydration. It has little food value for wildlife, although it provides habitats for many organisms. Its decayed vegetation contributes to the basic productivity of the marsh mud flat food web.

Behind the cord grass (above the median of the daily tides), "pickleweed" (Salicornia) becomes the dominant plant. Pickleweed and cord grass have little direct food value for the closely associated wildlife. However, both provide niches and nesting areas for wildlife which feed on the nearby mudflats. Two important species that feed and/or nest within the pickleweed habitat are the salt marsh harvest mouse and the California clapper rail. Both species appear on California Fish and Game's rare and/or endangered

species list (Figure 4-8). Other species which commonly feed and/or nest in the salt marshes are: (28, 35, 36, 37)

- Fish
  - Surfperch
  - Smelt
  - Stickleback
- Birds
  - Song sparrows
  - Long-billed marsh wren
  - White-tailed kite
- Shorebirds
  - Kildeer
  - Willet
  - Sandpiper
  - Marbled godwit
  - Avocet
- Mammals
  - Shrews
  - Raccoon
  - Weasel
  - Skunk
  - Rabbits

16.4.5 Freshwater Marshes

Also present within the South Bay are fresh water marshes. These areas are found at the heads of several tidal sloughs and at the tip of Ravenswoods Point. One such freshwater marsh is the portion at Alviso Slough near the San Jose Treatment Plant and sanitary landfill. Heavy growths of tule bulrushes and cattails along the banks of this slough provide cover for Redwing Blackbirds and Coots. Exposed mudflats near the Leslie Salt Ponds provide feeding grounds for Egrets and other wading birds. The headwaters of the slough are affected by a dike, creating a dead end near the landfill site, and resulting in limited flushing action

The fresh water marsh on Ravenswoods Point is a privately owned duck club. This diked marsh area is flooded with well water shortly before the hunting season (October-January). This flooding lures migrating ducks to the flood area for rest and feedings. During the rest of the year the marsh is dry, except for the deeper dredged channels next to the dikes. As a result of this annual fresh water flooding and the leaching of ground salts, both fresh and salt tolerant plants and grasses grow within the marsh. Animal life within the marsh is limited to the higher ground areas.

16.4.6 Mudflats

Mudflats are an extensive feature of San Francisco Bay covering thousands of acres between low and high tides (33, 35, 36, 38). Their substrates may have a moisture content of close to 75 percent by weight. They serve as a surface on which many microorganisms such as blue-green algae, diatoms, and worms abound. A variety of invertebrates thrive in the mud and these in turn are fed upon by various shorebirds. When the tide is in, diving ducks and fish are nourished there.

Some of the plants that live on the mudflats are diatoms, blue-green and green algae, and red algae (37).

Over one hundred species of invertebrates have been collected from the mudflats. Some of the more common invertebrates found living upon and in South San Francisco mudflats are (37):

- Roundworm
- Ribbon worm
- Segmented worm
- Crustaceans
  - Barnacles
  - Shore crabs
  - Commercial crab

- Mollusks
  - Japanese littleneck clam
  - Bent-nosed clam
  - Oysters
  - Ribbed mussel
  - Bay mussel
  - Mud snail
  - Moon snail
  - California horn snail

The productivity of mudflats may be measured by the number of birds (shorebirds) that feed upon the exposed flats. Some of the shorebirds known to feed upon the flats within the southern portions of San Francisco Bay are Killdeer, Black-bellied plover, Willet, Western sandpiper, Dowitchers, Marbled godwit, and Avocets (28, 37, 39).

Not all parts of mudflats are equally productive. Flats adjacent to open water are commonly exposed to strong tidal currents and seasonal winds. The sediment composition of this flat contains more silt-size particles thereby creating more favorable niches for invertebrates. The nearby marshes continuously deposit plant detritus. These two features combine to produce niche feeding grounds for shorebirds and wintering-over birds that visit the Bay Area (28, 37).

16.4.7 Open Water Environment

The open water environment is that portion of the Bay which is constantly covered by the brackish waters. Within the southern portion of San Francisco Bay, the open water environment is the central ship channel and the shoals adjacent to this deeper water. The sediment size varies from sand to sandy-silt depending on the season and tidal currents. This, in conjunction with poor water quality, decreases the diversity of animals living within this environment, especially in the southern portion of San Francisco Bay.

Those animals that seem to show a strong seasonal variation within this open water environment are mollusks, various crustaceans and worms.

These invertebrates in turn are fed upon by Loons, Grebes, Cormorants, Terns, Canvasbacks, and several diving ducks (37).

Although the fish population drops off rapidly south of the Dumbarton Bridge, the following fish are known to feed in the open waters as well as on the covered open mudflats Striped bass, Sturgeon, Flounders, and Skates (40, 41).

The ecological value of this open water habitat lies in its capabilities of transporting inorganic chemicals and plankton across the expansive mud flats. This exchange of inorganic chemicals and micro-plankton for by-products of plants and animals living in and upon the mud flats and marshes is the basic ecological link within the Bay ecosystem (37).

16.4.8 Rare or Endangered Species

California's listing of endangered and rare fish and wildlife includes three species found in the South Bay marshlands (Figure 4-8). These species are:

- California least tern — endangered, seen nesting and feeding in Leslie Salt Pond A-1 vicinity (Figure 4-6).
- California clapper rail — endangered, primary nesting areas along Ravenswood Slough, San Mateo County, and between Cooley Landing and the Palo Alto Municipal Airport, and secondary nesting areas along the dikes and sloughs from the Santa Clara County/San Mateo County boundary slough through Alviso Slough.
- Salt-marsh harvest mouse — endangered, critically low numbers in the Salicornia and Spartina marshes along the Baylands dikes and sloughs. Low numbers are attributed to the higher tidal ranges and habitat destruction common to the South Bay (37).

The California brown pelican, also endangered, has been sighted in large numbers in salt ponds and open water stretches of the Bay, particularly in the winter months.

Two species proposed for addition to the rare and endangered species list are:

- Salt-marsh song sparrow – the southern race is confined to South San Francisco Bay where nesting occurs in *Salicornia* marsh
- Vagrant shrew – a small insectivore, active virtually 24 hours a day, feeding on salt marsh insects

These species, and others confined to marshlands in the South Bay, are threatened with continuing habitat destruction.

16.5 CULTURAL ENVIRONMENT

16.5.1 Population

Historical population growth in Santa Clara County is compared in Table 16-4 with population growth in the United States, in California, and in the nine-county San Francisco Bay Area (15). Population growth in Santa Clara County lagged behind state growth between 1900 and 1940, as is shown by the declining percent of state population in the county in each decade. However, after 1940, growth was more rapid in the County than in the state. From a low of 2.5 percent of the California total in 1940, Santa Clara County grew to contain 5.4 percent of the total population in California in 1970.

Another indication of relative growth is seen in comparative ratios which have been computed for the United States, for California, for the San Francisco Bay Area, and for Santa Clara County between 1900 and 1970. Whereas there were a little more than 2.5 times as many persons in the United States in 1970 as in 1900, there were 13 times as many in California. Whereas there were 7 times as many persons in the San Francisco Bay Area in 1970 as in 1900, there were almost 18 times as many in Santa Clara County.

Table 16-4

POPULATION GROWTH IN THE UNITED STATES, IN CALIFORNIA, IN THE SAN FRANCISCO BAY AREA, AND IN SANTA CLARA COUNTY

1900 to 1970 (Population in 1000's)
(Population in 1000's)

Year	United States	California	San Francisco Bay Area	Santa Clara County	
				Number	% California
1900	75,994.6	1,485.1	658.0	60.2	4.05
1910	91,972.3	2,377.5	925.7	83.5	3.51
1920	104,710.6	3,426.9	1,183.0	100.7	2.94
1930	122,775.0	5,677.3	1,578.1	145.1	2.56
1940	131,669.3	6,907.4	1,734.4	175.0	2.53
1950	151,325.8	10,586.2	2,681.3	290.5	2.74
1960	179,323.2	15,863.0	3,676.2	658.7	4.15
1970	200,263.7	19,703.0	4,519.2	1,070.0	5.43
Ratio: 1970/ 1900	2.64	13.27	6.98	17.77	

Source: U.S. Census Data. The San Francisco Bay Area in the tabulation includes the counties of: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma.

It was World War II that gave a sudden boost to the Santa Clara County economy and led to the establishment of many new industries in the area between Palo Alto and San Jose. This industrial base was expanded subsequently, and many new firms have been formed by individuals who first became acquainted with the area during their employment with one of the larger firms.

Population growth did not occur to any extent in Santa Clara County until job opportunities began to develop in the area. After World War II population and employment in the San Francisco Bay Area, as in other metropolitan centers, tended to move out from the center as factories grew old and had to be replaced, and as land values rose and made continuation of production in the more congested areas unfavorable. The relatively low cost and availability of open areas at the margins of existing centers made them attractive to industry. In the San Francisco Bay Area, Santa Clara County shared in that outward movement with Alameda and Contra Costa counties to the east and north.

The outstanding growth in County employment has been in manufacturing, as shown in Table 16-5 (15). Whereas population grew sixfold between 1940 and 1970, manufacturing employment grew fifteenfold. Most of the growth in manufacturing employment was in the durable good fields.

Not only did employment in manufacturing exceed population growth, but employment by various levels of government grew much more rapidly than population. Service employment and employment in finance, insurance, and real estate also gained relatively. However, food processing, which was long a major factor in the economy of Santa Clara County, did not increase in proportion to population, partly because agricultural lands were converted to other uses and the local supply of fruits and vegetables was reduced in relation to other growth.

Table 16-5

AVERAGE ANNUAL EMPLOYMENT IN SANTA CLARA COUNTY IN SELECTED YEARS, 1940 TO 1969
(1,000's)

Employment Field	1940	1950	1960	1969	Ratio 1969 to 1940
Agriculture	9.4	16.2	11.1	7.2	0.77
Contract Construction	4.7	9.4	17.8	20.3	4.32
Manufacturing	8.6	22.1	70.3	128.6	14.95
Durables	3.0	9.0	51.6	101,4	33.80
Non-Durables	5.6	13.1	18.7	27.2	4.86
Food	4.1	10.9	12.7	15.3	3.73
Transportation, Communication, and Utilities	3.6	6.1	9.6	16.4	4.56
Trade	12.6	22.6	40.7	75.8	6.02
Finance, Insurance, and Real Estate	2.1	3.2	7.9	15.2	7.24
Service	13.6	18.3	43.2	91.8	6.75
Government	5.1	11.7	26.8	56.4	11.06
Others	0.5	0.3	0.6	1.0	2.00
Totals	59.9	109.9	228.0	412.7	6.89

Source: Data from table in Santa Clara County Profile, prepared and distributed by Santa Clara County Chamber of Commerce

Original source: California Department of Human Resources

Of the 128,600 persons employed in manufacturing, 73,200 persons were employed in the aerospace industry in 1969. This unusual concentration of employment explains in large part the substantial growth in the County.

Population projections adopted for the purposes of this report are developed from those prepared by the Department of Water Resources (DWR) in cooperation with the State Department of Finance (DOF). Two projection series are adopted, termed "Baseline" and "Low Growth," corresponding to DWR series D/150 and E/0, respectively.

The third series of population projections developed by DWR, termed the "High Growth" (C/300) series, were not considered, owing to the critical air quality of the basin, thus providing a basis for anticipation of low population growth.

Population projections (Table 16-6) used for the project area are taken from DWR data for that portion of Santa Clara County lying within Hydrologic Basin 2, as designated by the State Water Resources Control Board. This area very closely approximates the project area.

Table 16-6

PROJECTED POPULATION IN THE STUDY AREA*
(in thousands)

	1970	1975	1980	1990	2000
D/150	1043.6	1165.0	1289.6	1596.4	1903.1
E/0	1043.6	1141.8	1234.6	1447.0	1630.8

*That portion of Santa Clara County that lies in Basin 2 Boundaries, including all service areas.

Based upon the employment structure in recent years, upon trends in the relative importance of the several major types of employment in Santa Clara County and in the State of California, and in terms of the projected population growth, projections of future employment in the county have been prepared and are shown in Table 16-7. These projections show a continuation of the decline in importance of agriculture, a slight increase in manufacturing, mostly in non-durables, and increasing construction, trade, and services.

Table 16-7

PROJECTED SANTA CLARA COUNTY EMPLOYMENT (15)

Economic Base	Number Employed 1970	Percent of Total	Number Employed 2000	Percent of Total	Percent Increase Expected 1970-2000
Agricultural	9,700	2.2	10,500	1.5	-30
Manufacturing	138,000	31	238,700	34	73
Service	96,800	22	169,400	24	75
Wholesale and Retail Trade	79,200	18	168,000	24	33
Total Employment	440,000	100	700,000	100	56

Source: DWR/DOF

Continued growth in population in Santa Clara County indicates a continued growth in employment. The rapid growth in the past was associated with an unusual upsurge in manufacturing activities in the County. Estimates of future employment show employment leading population, rising from 400 employed per 1,000 population, to 431 per 1,000. It is believed that employment opportunities in the County will be the main force for growth

in the future. However, more of the employment will be in locally oriented activities, such as trade and service, and in the production of manufactured products for the local and regional market. Less dependence will be placed on national and international markets.

15.5.2 Land Use

15.5.2.1 Santa Clara County. The comprehensive land use inventory of Santa Clara County made in 1967 (42) by the County Planning Department is the basis for the analysis which follows. Santa Clara County has a total of some 847,000 acres. Of this amount, 752,300 acres are subject to taxation. In 1967 when the land use inventory was prepared, there were about 960,000 persons living in the County. In Table 16-8, the assessed land use in 1967 is shown by major categories, and acres per 1,000 population are computed.

Over 85 percent of the assessed land in the county in 1967 was in either agricultural use or in some other use considered not to be developed. Including vacant urban lands, the land not used for residential, industrial, commercial, or other such uses represented about 90 percent of the total. Conversely, only 10 percent of the land in Santa Clara County was in urbanized uses.

In 1967 almost 80 percent of the lands in the County that were used by industry were in seven cities located around the southern tip of San Francisco Bay. San Jose alone accounted for almost 30 percent of the industrial land in the County.

There was a total of almost 685,000 acres of open land in Santa Clara County in 1967. Some 15,700 acres of this was classed as urban vacant, but the greater part by far was classed as agricultural (542,000 acres) or other (126,500 acres) (see Table 16-8).

Table 16-8

LAND USE IN THE BAYLANDS STUDY AREA, COMPARED WITH COUNTYWIDE LAND USE, 1967 (15)

Land Use	Assessed Lands County			Lands in Study Area (below 6.5 contour)		
	Total Acres	Percent	Acres per 1,000 People	Total Acres	Percent Within Study Area	Percentage of Study Area to County Area
Residential	48,200	6.4	50.2	430	2.1	0.9
Industrial	6,300	0.8	6.5	860	4.5	8.2
Transportation, Utilities	1,400	0.2	1.5	430	2.2	30.5
Commercial	4,300	0.6	4.5	70	0.4	1.6
Public	7,100	0.9	7.4	200	1.0	2.8
Urban, Vacant	15,700	2.1	16.4	960	4.9	6.1
Agricultural	542,800	72.2	565.5	3,250	16.4	0.6
Other (includes)	126,500	16.8	131.7	—	—	10.7
Open Space				0	—	
Marsh				1,920	9.7	
Salt Ponds				9,910	50.0	
Bay Water				1,760	8.9	
Total	752,300	100.0	783.6	19,800	100.0	2.6

Source: Basic data from land use inventory, 1967, Santa Clara County Planning Department

The Baylands include less than one percent of the residential land in the County, but accounts for some 30 percent of all land in transportation or utility use. About one acre of each 12 acres of industrial land in the County is found in the Baylands. Commercial and agricultural lands in the area are below average but are not a large part of the County total. The "other" category is equal to almost 11 percent of the County total. This class includes marshes, salt ponds, and water areas.

16.5.3 Aesthetics, Historical, Archaeological, Scientific Development, or Educational Value

16.5.3.1 Archaeologic Sites in Santa Clara County. Known archaeologic sites have been found throughout Santa Clara County (29). The Indian settlements were related to the abundance of food supply and its seasonal variations in location. The Bay and its marshlands, the all-year streams, and the oak groves were all attractive living areas and food producers.

Besides the known sites, there are undoubtedly many undiscovered archeologic sites in the County. Planning for construction projects should include investigation of the possibility of a site containing valuable archeologic remains and a plan to preserve them or remove and record them with the assistance of archeologists. Particular attention should be given to sites that fall within the locational categories described below. In Santa Clara County there are five areas which are likely to have the largest number of sites:

- At the point where the streams from the hills break out on the edge of the valley. (On the hillside edge near the stream and the stream's alluvial fan onto the valley floor)
- Areas on streams or sloughs near to the historical edge of the San Francisco Bay marsh
- Shell mounds or the evidence of some significant piles of clam or mussel shells along Bay front streams or in the Baylands marsh area

- Rock out-cropping with evidence of designs cut into the rock. Often such work indicates an archaeological site or sites nearby
- A cave or rock overhang with evidence of pictures on stone or possibly designs cut into the rock may indicate a nearby archaeological site

16.5.3.2 Paleontologic Resources. Bones and fossils of ancient animals are found in soil or imbedded in rock formations. Paleontologists have recently made several significant finds in Santa Clara County (29). Included are the discovery of the skeleton of a rhinoceros-like animal in excavation for the Stanford Linear Accelerator; the discovery of a mastodon tusk in the bank of San Francisquito Creek; discovery of mastodon bones at the intersection of Page Mill Road and Junipero Serra Freeway, and in a road cut along Skyline Boulevard; and, discovery of prehistoric remains of camels, ground sloths, and mastodons in shallow excavations at the future site of the Mountain View Baylands Park. Recent geologic investigations have uncovered specimens from formations of the Miocene age (ten to thirty million years ago, when these formations were below the sea). Included in these rocks are the fossils of snails, oysters, scallops, clams, and sand dollars. There may well be important finds in the County from time to time.

16.5.3.3 Historical Resources. An "Inventory of Historic Landmarks, Santa Clara County," made by the County Planning Department in 1962, listed 130 landmarks of various kinds (29). It included Indian village sites (mounds), the several sites of the Santa Clara Mission, and several adobe buildings dating for the most part from 1950 to 1900. Since 1962, 24 County historic landmarks have been designated as Registered California Historic Landmarks, while seven have been included in the National Register of Historic Places. In March 1973, the Board of Supervisors established a County Historic Heritage Commission. There are also Historic Commissions or Historical Societies in several of the cities of the County.

part IV
The Environment

Section 17 Environmental Setting of Alternative 5

Section 17

ENVIRONMENTAL SETTING* OF ALTERNATIVE 5 (OCEAN DISPOSAL)

17.1 PHYSICAL

Geologic characteristics specific to the area of the conveyance pipeline from Palo Alto to the discharge point in the ocean are described below.

The major structural features of the San Francisco Bay Region are the San Andreas Fault Zone to the west of the Bay and the Hayward Fault Zone to the east. The San Andreas Fault is a principal structure feature of California and is traceable for over 500 miles. In general, the basement rocks to the west of the San Andreas Fault are quartz diorites and metamorphic rocks while to the east of the fault the Franciscan Formation forms the basement rocks. The San Andreas Fault Zone is seismically active and has been the focus of a number of severe earthquakes.

The hydrology specific to the area of the conveyance facility from Palo Alto to the discharge point in the ocean is presented below.

The proposed location of the ocean outfall originates in the vicinity of Martins Beach, about six miles south of Half Moon Bay, and proceeds in a westerly direction seven miles into the Pacific Ocean, terminating with a diffuser section at a depth in excess of 200 feet.

The local current pattern in this area is complex (43). The USCGS Tidal Current Tables show the tidal current to be "weak and variable." In the

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*A brief version of the environmental setting is presented in Section 14.

coastal tidal current area farther offshore, the onshore component is 0.4 knot at flood tide, both at the surface and at middepth (about 75 feet). The movement of water in this region during the Davidson Current Period (November-February) is a counter-clockwise eddy.

During the first part of the Upwelling Period (February-May), the general trend of water movement is northward while the California Current flows southward farther offshore. However, the controlling current pattern can be expected to reverse during the summer (June-July) toward the end of the Upwelling Period when the California Current has a stronger effect over the whole coastal area.

During the Oceanic Period (August-October), the current direction over most of the continental shelf area is southward, but the near shore counter-currents begin to form along the immediate coast region (43).

For an ocean discharge of wastewater, the variation of water density with depth is an important characteristic, since it determines to a large extent whether or not the discharge will remain submerged. In the area of discharge, the water density differences are determined primarily by water temperature, since the salinity variations are small. Expected temperature variations between bottom and surface for the four current periods are as follows: 1) Davidson Current Period, 12-13°C, 2) Upwelling Period, 9-13°C, 3) Summer Period, 9.5-14°C, and 4) Oceanic Period, 11-17°C (30). Based on the ocean temperature profiles and the temperature of wastewater, it is expected that the discharged wastewater will rise to the surface.

The ocean water in the discharge area is expected to have a Secchi disk transparency value in excess of 30 feet during the Oceanic Period, as high as 60 feet during periods of low plankton concentration and minimum inorganic turbidity, and as low as 15 feet during periods of high plankton concentration. In contrast, the maximum Secchi disk transparencies observed in San Francisco Bay are in the range of 8 to 10 feet.

The general chemical characteristics of the ocean water, at a salinity of 33.5 percent are as follows:

Chlorides, Cl^-	18,400 ppm
Sulfate, $SO_4^{=}$	2,570 ppm
Bicarbonate, HCO_3^-	136 ppm
Sodium, Na^+	10,000 ppm
Magnesium, Mg^{++}	1,230 ppm
Calcium, Ca^{++}	390 ppm
Potassium, K^+	370 ppm

Nutrient substances tend to change in concentration as they are removed by biological action or replenished by upwelling or land contributors.

Expected dissolved oxygen concentrations at the surface, middepth and bottom during the summer and Oceanic Periods, are 9, 6, and 4 mg/l, respectively.

Coliform bacteria occur in the sea (salt water) only as the result of pollution either from land and ship sources, or from birds and marine mammals.

The noise specific to that area of the conveyance pipeline from Palo Alto to the discharge point in the ocean is relatively low due to the suburban area from Palo Alto to Woodside, and the nonurban area west of this point to the discharge in the Pacific Ocean.

The hazards specific to that area of the conveyance facility from Palo Alto to the discharge point in the ocean include:

- Floods from the higher mountain areas, with attendant potential for soil erosion and the undermining of the pipeline

- Fires in the nonurban hilly areas, which would destroy the vegetative cover and increase the risk of soil erosion, land slides, etc.
- Seismic activity along the San Andreas fault, which would increase the risk of pipeline breakage.

Mineral resources of commercial importance specific to that area include rock suitable for road base construction.

Food resources specific to that area are primarily for cattle rangelands.

17.2 BIOLOGICAL

A number of biotic communities can be found along a transect from Palo Alto to the Pacific Coast. These include freshwater marshes, coastal scrub, closed-cone pine forest, redwood forest, Douglas Fir forest, broadleaf evergreen forest, and grasslands.

Around springs and ponds, associations of freshwater marsh plants, such as the California bulrush, California cattail, common tule, and various sedges, support large populations of waterfowl and game species. These marshes are dry during parts of the year due to evaporation and percolation of water into the soil unless water levels are artificially maintained. A typical marsh association may be found at Searsville Lake near Menlo Park.

Scattered patches of coastal prairie consisting of brome grasses and other species and supporting rabbits, ground squirrels and some song-birds may be found on hills and valleys in the coast range. This habitat is dry all summer, greening up with the first fall rains and maturing in the spring. Approximately 13 percent of San Mateo County is grassland.

On the foothills of the coastal range, open stands of broadleafed trees, primarily oaks, and grassland species may be found. This habitat integrates between the grasslands and the coastal forests.

Jasper Ridge, behind Searsvile Lake, is an example of a stand of tanoak, laurel, madrone, buckeye, and other evergreen species which support moderate populations of wildlife, including tree squirrels, song birds, and amphibians.

San Mateo County is 25.5 percent coastal forest. These forests have dense stands of Douglas Fir in scattered patches, stands of coastal redwood as well as interrupted patches of closed-cone pines on the seaward side. These forests support a variety of birds. Open brushfields, which result from logging operations, support dense populations of deer and game birds.

Dry, rocky, gravelly slopes below 3000 feet elevation support tolerant species such as California sagebrush. These areas, approximately 10 percent of San Mateo's land area, support moderate populations of quail, rabbit and deer as well as a variety of non-game animals.

The ocean bottom between Pillar Point and Pigeon Point ranges from fine, hard packed sand to soft muds with washes of coarse sand near creek mouths and with outcroppings of rocky reeds offshore (44, 45, 46). Much of the same biota inhabitating rocky intertidal areas may be found on nearshore reefs (7):

- Starfish
- Crabs
- Mollusks
- Sponges

while deeper reefs exhibit a faunel assemblage less well known, including:

- Brittle stars
- Coralline algae
- Worms

A rich invertebrate fauna is found on sandy and muddy bottoms with different sediment assemblages supporting different species assemblages. Polychaetes are the most numerous and diverse of the fauna found in these areas and commercially important species include the market crab. Fishes found over the mud sand areas include migratory species such as (7):

- King salmon
- Silver salmon
- Albacore
- Pacific bonito
- Jack mackeral
- Pacific mackeral

and bottom fishes such as:

- Sand sole
- English sole
- Sanddab
- Petrale sole
- Sablefish
- Bocaccio
- Chilipepper
- Widow rockfish
- Pacific hake

Many of these fish are commercially important with major fishing areas for these species generally outside the 50 fathom line. A significant sport fishery is also based on this fish fauna (7).

Other species found in the area include the same predatory pelagic fishes found elsewhere on the coast as well as marine mammals such as porpoises

and dolphins. The plankton is typical of that found along the coast, being dominated by diatoms, dinoflagellates and copepods (7).

The coastline from Pillar Point to Pigeon Point consists primarily of unprotected or open beaches. Intertidal habitats of diverse types are found, ranging from exposed sandy beaches, such as those between Tunitas Beach and Pescadero Creek, to rocky shores with small sand beaches, such as between Pescadero Creek and Pigeon Point. Organisms vary with the type of shoreline and with tidal influence (7, 47).

Unprotected rocky coasts have species assemblages adapted to heavy surf action and these associations are similar along the entire Pacific coast. The most conspicuous species are the California mussel, gooseneck barnacles and the common starfish. Mussel beds provide protection for a number of other species not adapted to the heavy surf. Between mussel beds may be found tide pools with another associated species such as hermit crabs. Brown, red, and green algae can also be found with crustose and coralline algae dominating (7).

Unprotected sandy shores exhibit a faunal association that is not as diverse as that of rocky shores. Characteristic species are isopods, the razor clam, and mole crabs — species adapted to burrowing. Algae are lacking at exposed sandy beaches (7).

Bottom sediments (45, 46) offshore from Pillar Point are fine, hard packed sands and silt with low organic carbon content and no medium sands or clay. Sediment characteristics change to soft muds south of Pillar Point and consist of fine sand, silt, and medium sand with little or no clay near Ano Nuevo Point. Moving offshore from Ano Nuevo to 300 foot depths, more clay and more organic carbon and less sand are found.

Five zones characterize the area:

- A nearshore zone in Half Moon Bay of high hornblend content
- An offshore zone of a mixture of high to moderate amounts of hornblend-augite-hypersthene and with trace amounts of Franciscan minerals
- High hypersthene offshore
- Tongues of material extending from streams
- Offshore zone of moderate hornblende

These zones result from stream drainage, cliff erosion, recent longshore drift and sediment deposits.

part V

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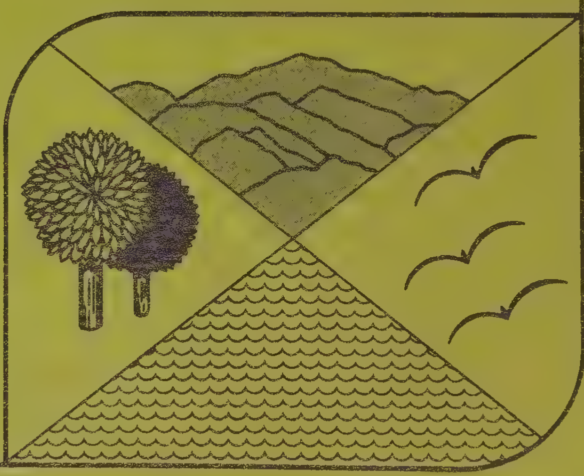

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part VI

Appendices

part VI
Appendices

Appendix A Interim Water Quality Objectives for San Francisco Bay

CHAPTER VI

WATER QUALITY OBJECTIVES AND WASTE DISCHARGE PROHIBITIONS

It is the intention of this Regional Board to regulate all controllable factors so as to protect the quality of Basin waters from deterioration and to ultimately enhance the quality of all waters. The ultimate protection from the effects of wastewater will be best afforded by source control of non-degradable deleterious materials, reclamation of all reclaimable portions and relocation of non-reclaimable portions to areas where the environmental impact would be negligible. Until this becomes fully feasible, an interim level of protection and enhancement must be achieved. The most effective means of doing this appears to be by a combination of improved treatment and relocation of discharges to areas where the wastes would receive adequate dispersion and assimilation during the interim period. This concept for interim protection is based upon evaluations of the following factors:

1. The ecosystems in the ends of the Bay system have already been adversely affected by wastes.

2. The nature of all of the specific waste constituents which adversely affect these areas is not yet known in sufficient detail to determine treatment needs.

3. Although treatment processes are available which can remove from wastewater the toxicants and nutrients that have been identified, their technical and economic feasibility for application in this Basin has yet to be adequately demonstrated.

Extent of relocation and degree of treatment needed to meet these objectives will be thoroughly reevaluated as the results of current studies by subregional groups of dischargers and by State agencies become available.

Within the context of the need to implement waste treatment and disposal programs at early dates and the current pertinent studies it is this Regional Board's intention to implement the following water quality objectives and prohibitions. These objectives and prohibitions are designed to maintain or enhance water quality.

WATER QUALITY OBJECTIVES

No controllable water quality[1/] factor shall cause any of the following water quality objectives to be exceeded.

A. TIDAL AND NON-TIDAL SURFACE WATERS

Apparent Color

No significant variation beyond present natural background levels.

Turbidity

No significant variation beyond present natural background levels.

Bottom Deposits

None in measurable concentrations above natural background levels.

1/ "Controllable water quality factor" means any human activity or natural occurrence which directly or indirectly affects water quality and can be regulated.

Floating Material

None other than of natural causes.

Oil or Other Materials of Petroleum Origin

None floating in quantities sufficient to be visible and none suspended or deposited at any place.

Odor

None other than of natural causes.

Pesticides[1/]

No individual pesticide or combination of pesticides shall reach concentrations found to be deleterious to aquatic biota or wildlife or reach objectionable levels in fish or shellfish used for human consumption.

Hydrogen Ion Concentration - pH

There shall be no significant change in the natural ambient pH value at any place in the main body of the receiving water, nor shall the pH of the waste itself exceed the range 7.0 to 8.5; or 6.5 to 8.5 when the natural ambient value is as low as 6.5.

Biostimulants

None in concentrations sufficient to cause deleterious biotic growths. Whenever natural factors cause such concentrations, then controllable factors shall not cause further increase.

Toxic or Other Deleterious Substances[2/]

No toxic or other deleterious substances shall be present in the receiving waters in concentrations or quantities which will cause deleterious effects on aquatic biota, wildlife or waterfowl or which render any of these unfit for human consumption either at levels created in the receiving waters or as a result of biological concentration.

Radioactivity

None present in concentrations exceeding levels set forth in California Radiation Control Regulations, Subchapter 4, Chapter 5, Title 17, California Administrative Code.

Temperature

Those objectives prescribed by the State Water Resources Control Board in its "Policy Regarding the Control of Temperature in Coastal and Interstate Waters and Enclosed Bays and Estuaries of California."

B. TIDAL WATERS

Bacteria

Sewage bearing wastes shall be treated to the following levels of quality at all times:

1/ Pesticide means any substance or combination of substances used to control objectionable insects, weeds, rodents, fungi or other forms of plant or animal life.

2/ Including but not limited to pesticides, heavy metals, materials such as polybichlorinated biphenols and all materials which impart a taste or odor to fish, wildlife or waterfowl flesh.

Discharges to any embayment, slough, creek or other confined or shallow waters:

Volumetric Dilution	Quality
Tidal water: Waste, at point of access	
Equal to or greater than 100:1	The waste shall not cause the receiving water surface to exceed that bacterial quality prescribed in Section 7958, Title 17, California Administrative Code.
Less than 100:1 but greater than 10:1	The waste shall not cause the receiving water surface to exceed a median MPN of coliform organisms of 23/100 ml as determined from the results of the previous consecutive 7 days for which analyses have been completed.
Equal to or less than 10;1	At some point in the treatment process the waste shall not exceed a median MPN of coliform organisms of 2.2/100 ml as determined from the results of the previous consecutive 7 days for which analyses have been completed, and the waste as discharged shall not exceed the following limits of quality:

	5-day 20^{0}C BOD	5.0 mg/l median 10.0 mg/l maximum
	Turbidity	10 Turbidity Units maximum

The Regional Board will consider exceptions to the above coliform objectives for dilutions of less than 100:1 for certain wet weather discharges when it deems that an inordinate financial burden would be placed on the discharger and when it finds that an equivalent level of environmental protection can be achieved by alternate means.

Submerged deepwater discharges in the Bay System:

The waste shall not cause the receiving water at any place within one foot of the surface to exceed that bacterial quality prescribed in Section 7958, Title 17, California Administrative Code.

The criteria prescribed in the "National Shellfish Sanitation Program Manual of Operations, Part 1, U. S. Department of Health, Education and Welfare" are the objectives for any area being protected for the taking of shellfish for human consumption.

Dissolved Oxygen

Present levels of dissolved oxygen will be preserved but in areas where oxygen levels are less than the following, the following objectives shall apply to the main body of the tidal waters:

Annual median	80 percent of saturation
Minimum	5.0 mg/l

When natural factors cause lesser concentration, then controllable water quality factors shall not cause further reduction.

Salinity

Ocean Waters

No significant variation beyond natural background levels.

Tidal Waters East of the Westerly End of Chipps Island

This Regional Board will regulate waste discharges so as to protect the beneficial uses for which these waters will be suitable under the terms of the State Water Resources Control Board's water rights decision. The State Board has the responsibility of regulating fresh water releases from the Delta so as to maintain that water quality needed to protect appropriate beneficial uses. The State Board is currently preparing its water rights decision on the Delta.

C. NON-TIDAL SURFACE WATERS

Dissolved Oxygen

The objective for tidal waters will apply except in streams used for salmon, steelhead and/or trout spawning where a minimum of 90 percent of saturation is required at all times. When natural factors cause lesser concentrations, then controllable water quality factors shall not cause further reduction.

D. GROUNDWATER

No controllable water quality factor shall degrade the quality of any groundwater. This Regional Board will consider exceptions where the controllable factor is reclaimed wastewater and where existing and potential beneficial uses will be protected.

E. RECLAIMED WASTEWATER

Those quality limits prescribed in Title 17, Sections 8025 through 8050, California Administrative Code. [1/]

WASTE DISCHARGE PROHIBITIONS

The following waste discharges are hereby prohibited. These prohibitions will become effective upon approval of this Plan by the State Board.

A. DISCHARGES TO TIDAL WATERS

1. Any sewage bearing wastewater, regardless of the degree of treatment, at any place:

   a. Inland from the Golden Gate; within 200 feet offshore from the extreme low water line.

   b. In the Ocean; where they will adversely affect waters over rocky substrates or within 1000 feet offshore from the extreme low water line and where the waste will not receive a minimum dilution ratio of 100:1 as it reaches the surface.

The Regional Board will consider exceptions from the above prohibitions for certain wet weather discharges and other discharges having high initial dilution when it deems that an inordinate financial burden would be placed on the discharger and when it finds that an equivalent level of environmental protection can be achieved by alternate means.

1/ This Board will consider incorporating in this Plan certain reliability criteria which we understand are now being developed by the State Department of Public Health

c. To Tomales Bay, Bolinas Lagoon and Drakes and Limantour Esteros.

2. Any discharge which does not comply with the water quality objectives for tidal waters contained in this plan.

3. Any sewage bearing wastewater, regardless of the degree of treatment, from vessels to the San Francisco Bay system, Tomales Bay, Bolinas Lagoon, Drakes and Limantour Esteros, and Princeton Harbor.

B. OTHER DISCHARGE PROHIBITIONS

1. Floatable rubbish or refuse into surface waters or at any place where it may contact surface waters.

2. Silt, sand, soil, clay or other earthen materials from mining, construction, agricultural, lumbering or any other onshore operation in quantities sufficient to cause deleterious bottom deposits or turbidity or discoloration in excess of natural background levels in surface waters.

3. Oil or materials of petroleum origin in quantities sufficient to be visible.

4. All sewage bearing wastes to non-tidal waters. This Board will consider exceptions where a discharge is approved as part of a reclamation project or where an alternate discharge location is not possible.

5. All conservative toxic and deleterious substances, including but not limited to such heavy metals as mercury, lead and cadmium, above those levels which can be achieved by source control, to waters in the Basin.

6. All discharges of sewage sludge and industrial sludge to waters in the Basin.

BOARD INTENTION TO ADOPT PROHIBITIONS

It is the intention of this Regional Board to adopt prohibitions no later than July 1, 1973 for all waste discharges to the following areas of limited tidal interchange which have not had substantially all toxicants and biostimulants removed:

1. South San Francisco Bay and the Northern and Eastern end of the Bay system.

2. Any embayment, slough, creek or other confined or shallow water area.

The details of the specific areas from which such wastes are to be excluded and the schedule for removal of existing discharges into those areas will be specified in the prohibitions.

part VI
Appendices

Appendix B Proposed "Basin Plan" Water Quality Objectives

Appendix B

State of California
California Regional Water Quality Control Board
San Francisco Bay Region

EXECUTIVE OFFICER SUMMARY REPORT
MEETING DATE: October 25, 1973

ITEM: 3

SUBJECT: BASIN PLAN WATER QUALITY OBJECTIVES

DISCUSSION: On July 31, 1973, the Regional Board held a workshop concerning the proposed Water Quality Objectives for the Basin Plan. Since that time, additional comments have been received and a technical level seminar on toxicity was held.

The Basin Contractor has prepared a revised draft of the Water Quality Objectives considering the inputs received from the workshop, seminar, and Retional Board staff. Appendix A is a summary of the objectives now being proposed. The staff has reviewed these objectives and is in concurrence with the Basin Contractor's recommendations. These objectives will be the basis of a task report on water quality objectives. That report will undergo review by the State Board, Regional Board, BASSA, Fish and Game, State Health and others before the objectives are finalized for planning purposes. The objectives will be the subject of public hearings and Board action after the final draft of the Basin Plan is completed in April 1974.

RECOMMENDATION: This item is presented for information only and no action is recommended at this time.

GLJ/dac
October 18, 1973

WATER QUALITY OBJECTIVES

RECEIVING WATER OBJECTIVES

pH: All water shall be maintained within the range 6.5-8.5; waste discharges shall not cause deviations of more than 0.2 units in marine or estuarine waters or more than 0.5 units in fresh waters.

Dissolved Oxygen: All waters designated for aquatic life shall be maintained at protection level B, unless within areas of special biological significance where protection level A shall apply.

In the Bay, the following objectives shall apply:

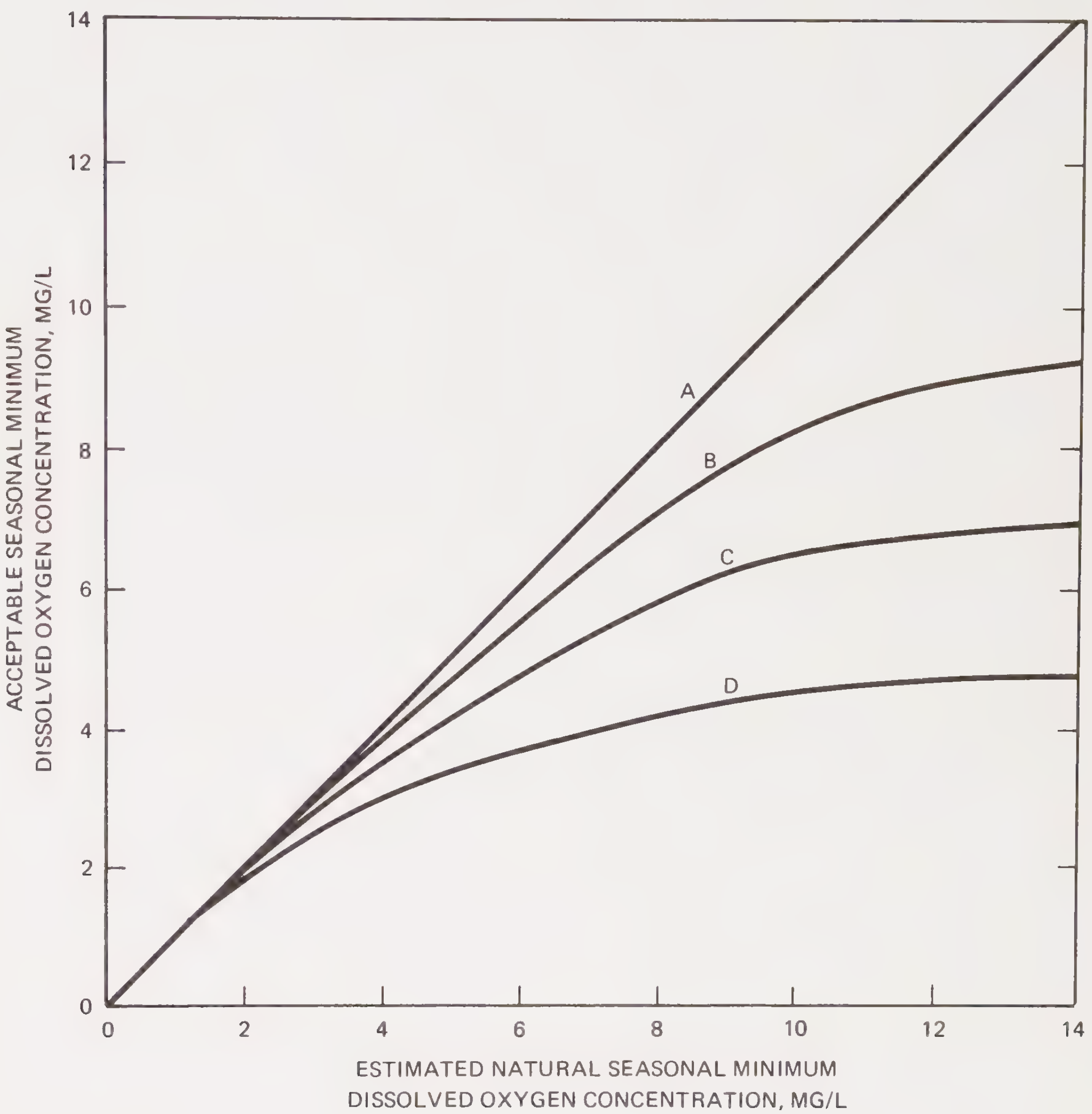
Downstream of the Carquinez Straits	5.0 mg/l minimum
Upstream of the Carquinez Straits	7.0 mg/l minimum

In nontidal waters, the following objectives shall apply:

Waters designated as cold water habitat	7.0 mg/l minimum
Waters designated as warm water habitat	5.0 mg/l minimum

When natural factors cause lesser concentrations, then controllable water quality factors shall not cause further reduction. Figure 10 describes the maximum permissible extent of seasonal dissolved oxygen variation from undegraded natural background levels.

Biostimulation: All waters shall be maintained such that the level of biotic growth does not cause nuisance or adverse effects on any protected beneficial water use as a result of man's activity. Whenever natural factors cause such biotic growth, then controllable factors shall not cause further increase.



ACCEPTABLE SEASONAL MINIMUM
DISSOLVED OXYGEN CONCENTRATION, MG/L
0
2
4
6
8
10
12
14
A
B
C
D
ESTIMATED NATURAL SEASONAL MINIMUM
DISSOLVED OXYGEN CONCENTRATION, MG/L

Figure 10

Turbidity: All waters shall be free from unnatural changes in turbidity or light transmittance where change impairs beneficial use. Deviations from normal background light penetration or turbidity relatable to waste discharge shall not be greater than 10 percent in areas of 10 J. T. U. or more ; waters of characteristically low natural turbidity shall be maintained so that discharges do not cause visible, esthetically undesirable contrast with the natural appearance of the water.

Temperature: Thermal or elevated temperature waste discharges shall not exceed those limits prescribed in the "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Bays and Estuaries of California." Furthermore, the temperature of all other waters shall not be modified by any controllable water quality factor to an extent which will adversely and unreasonably affect a beneficial use which has been designated for protection.

Sulfide: All waters shall be free from dissolved sulfide concentrations above present natural background levels.

Coliform Bacteria: Water quality objectives for bacterial indicators are listed below:

1) Waste discharges shall not cause San Francisco Bay waters to exceed a most probable number of coliform organisms of 1000 per 100 ml; provided that not more than 20 percent of the samples at any sampling station in any 30-day period may exceed 1000 per 100 ml, and provided further that no single sample shall exceed 10, 000 per 100 ml; nor shall the discharge cause the receiving water to exceed a fecal coliform median value of 50 MPN per 100 ml.

2) Waste discharges shall not cause ocean waters within a zone bounded by the shoreline and a distance 1000 feet from the shoreline or the 30-foot depth contour, whichever is further from the shoreline, and in areas outside this zone used for body-contact sports to exceed a most probable number of coliform organisms of 1000

per 100 ml; provided that not more than 20 percent of the samples at any sampling station, in any 30-day period, may exceed 1000 per 100 ml, and provided further that no single sample shall exceed 10,000 per 100 ml.

3) Waste discharges into waters capable of supporting unrestricted shellfish harvesting shall not cause those waters to exceed a median coliform concentration of 70 MPN per 100 ml, nor shall more than 10 percent of the samples exceed 230 MPN per 100 ml. Unrestricted shellfish harvesting areas shall, in every other respect, comply with the requirements of the "National Shellfish Sanitation Program."

Detrimental Deposits: All waters shall be free of substances attributable to controllable water quality factors that will form detrimental deposits and free from the presence of material that can cause or induce formation of deposited materials that can be deleterious to beneficial uses of waters and underlying surfaces, with or without resuspension of any deposits.

Floatables: Surface waters shall be free of visible oil, scum, floating debris, or other floating substances attributable to controllable water quality factors that produce adverse effects on beneficial uses.

Color, Odor and Taste: All waters shall be free of substances attributable to controllable water quality factors that produce detrimental, esthetically undesirable color, odor, or taste.

Fish Flesh Tainting: All waters shall be free of substances attributable to controllable water quality factors in concentrations sufficient to impart unnatural odor or taste to fish flesh or other edible products of aquatic origin.

Radioactivity: Radionuclides attributable to controllable water quality factors shall not be present in waters in concentrations in excess of those given in California Administrative Code, Title 17, or in concentrations which will result in accumulations of radionuclides in aquatic life to an extent which presents a hazard either to aquatic life or their consumers.

RECEIVING WATER OBJECTIVES (Continued)

Toxicity: No substances attributable to controllable water quality factors shall be present in waters in concentrations or combinations which are toxic to, or which produce detrimental physiological responses in humans, plants, fish and other animal life. Where specific identifiable substances can be demonstrated to be rapidly rendered harmless in the aquatic environment, this objective may be applied outside an initial dilution zone, where such an approach does not compromise beneficial uses. Limits established by The Environmental Protection Agency for receiving waters as defined in "Water Quality Criteria - 1972" shall apply where appropriate.

Chemical Quality: Water used for municipal and domestic water supplies shall after appropriate treatment be consistent with the requirements of the State Department of Health as shown in Table 11-8. Waters to be used for agricultural irrigation supplies or livestock watering shall not exceed the qualitative classification corresponding to that water use as shown in Table 11-4, 11-5, 11-6, and 11-7. The chemical quality of waters shall not exceed those limits established by the State Water Resources Control Board decision 1379 or cause impairment of marsh habitats in the San Francisco Bay system as a result of man's activity.

Ammonia: The discharge of wastes shall not cause concentrations of unionized ammonia to exceed 0.025 mg/l in the receiving water.

Table 11-4

Classification	TDS (mg/l)	EC (mhos/cm)	Boron (mg/l)
Water for which no detrimental effects are usually noticed	500	750	0.5
Water that can have detrimental effects on sensitive crops	500-1,000	750-1,500	0.5-1.0
Water that can have adverse effects on many crops, requiring careful management practices	1,000-2,000	1,5000-3,000	1.0-2.0
Water that can be used for tolerant plants on permeable soils with careful management practices	2,000-5,000	3,000-7,5000	2.0-10.0

[a] Crops vary greatly in their tolerance to salinity (TDS or EC). Crop tolerances are known and tolerance tables are available.

Table 11-5. Recommended Maximum Concentrations of Trace Elements in Irrigation Waters[a]

Element	For waters used continuously on all soil mg/l	For use up to 20 years on fine textured soils of pH 6.0 to 8.5 mg/l
Aluminum	5.0	20.0
Arsenic	0.10	2.0
Beryllium	0.10	0.50
Boron	0.75	2.0-10.0
Cadmium	0.010	0.050
Chromium	.10	1.0
Cobalt	.050	5.0
Copper	0.20	5.0
Fluoride	1.0	15.0
Iron	5.0	20.0
Lead	5.0	10.0
Lithium	2.5[b]	2.5[b]
Manganese	0.20	10.0
Molybdenum	0.010	0.050[c]
Nickel	0.20	2.0
Selenium	0.020	0.020
Vanadium	0.10	1.0
Zinc	2.0	10.0

[a] These levels will normally nor adversely affect plants or soils. No data available for mercury, silver, tin, titanium, or tungsten.

[b] Recommended maximum concentration for irrigating citrus is 0.075 mg/l.

[c] Only for acid fine textured soils or acid soils with relatively high iron oxide contents.

Table 11-6. Guide to the Use of Saline Waters for Livestock and Poultry

Total soluble salt content of waters (mg/l)	Comment
Less than 1,000	Relatively low level of salinity. Excellent for all classes of livestock and poultry.
1,000-2,999	Very satisfactory for all classes of livestock and poultry. May cause temporary and mild diarrhea in livestock not accustomed to them or watery droppings in poultry.
3,000-4,999	Satisfactory for livestock, but may cause temporary diarrhea or he refused at first by animals not accustomed to them. Poor waters for poultry, often causing water feces, increased mortality and decreased growth, especially in turkeys.
5,000-6,999	Can be used with reasonable safety for dairy and beef cattle, for sheep, swine, and horses. Avoid use for pregnant or lactating animals. Not acceptable for poultry.
7,000-10,000	Unfit for poultry and probably for swine. Considerable risk in using for pregnant or lactating cows, horses, or sheep, or for the young of these species. In general, use should be avoided, although older ruminants, horses, poultry, and swine may subsist on them under certain conditions.
Over 10,000	Risks with these highly saline waters are so great that they cannot be recommended for use under any conditions.

Table 11-7

GUIDELINES TO LEVELS OF TOXIC SUBSTANCES IN DRINKING WATER FOR LIVESTOCK

Constituent	Upper limit mg/l
Aluminum	5.0
Arsenic	0.2
Boron	5.0
Cadmium	.05
Chromium	1.0
Cobalt	1.0
Copper	0.5
Fluoride	2.0
Lead	0.1[a]
Mercury	.01
Molybedenum	0.5
Nitrate and Nitrite	100
Nitrite	10
Selenium	0.05
Vanadium	0.10
Zinc	25
Total dissolved solids (TDS)	10,000[b]

[a] Lead is accumulative and problems may begin at threshold value 0.05 mg/l.

[b] See Table 11-6 Guide to the Use of Saline Waters for Livestock and Poultry.

Table 11-8

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH REGULATION ON DOMESTIC WATER SUPPLIES

	Limiting Concentration[a]
Organic chemicals	
Carbon-alcohol extract	3.0
Carbon-chloroform extract	0.7
Foaming agent (MBAS)	0.5
Pesticides	
Aldrin	0.017
Chlordane	0.003
DDT	0.042
Dieldrin	0.017
Endrin	0.001
Heptachlor	0.016
Heptachlor epoxide	0.016
Lindane	0.056
Methoxychlor	1.0
Organophosphorous and carbamate compounds	0.1
Herbicides	
2, 4-D plus) 2, 4, 5-T plus) 2, 4, 5-TP)	0.1
Toxaphene	0.005
Radioactivity	
Gross Beta	1,000 pc/l
Radium-326	3 pc/l
Strontium-99	10 pc/l
Other	
Color	15 units
Odor	Threshold of 3
Inorganic chemicals	
Aracnic	0.10
Barium	1.0
Cadmium	0.01
Chromium	0.05
Cyanide	0.2
Lead	0.5
Mercury	0.005
Nitrate-N + Nitrite-N	10
Selenium	0.01

	Recommended limit	Upper limit	Short term limit
Total dissolved solids	500	1,000	1,500
or			
Specific conductance	800 micromhos	1,000 micromhos	2,400 micromhos
Chloride	250	500	600
Sulfate	250	600	600

[a]Concentration expressed in mg/l except where noted otherwise.

GROUNDWATER QUALITY OBJECTIVE

No controllable water quality factor shall degrade the quality of any usable groundwater resources or adversely affect long-term soil productivity. Where wastewater effluents are returned to land for irrigation uses, regulatory controls shall be consistent with Title 17 of the State Administrative Code.

EFFLUENT LIMITATIONS

Effluent limitations established by The Environmental Protection Agency under Sections 301, 302, 304, 306, and 307 of The Federal Water Pollution Control Act Amendments of 1972 and by the Water Quality Control Plan for Ocean Waters of California shall apply.

In addition to the above, the following effluent limitations shall apply:

Toxicity

Deepwater discharges:

No effluent shall exhibit a TL_m of less than 100% under a 96-hour bioassay with an acceptable test organism unless removal of the effects, from the test results, of constituents which have been demonstrated to be rapidly rendered harmless by degradation in the receiving water results in compliance with the following effluent bioassay limits:

Median Toxicity	-	equal to or greater than 90% survival
90 percentile value	-	equal to or greater than 70% survival

Shallow water discharges:

The survival of test fishes in 96-hour bioassays of the effluent shall achieve a median of 90 percent survival and a 90 percentile value of not less than 70 percent survival.

Coliform Bacteria

No waste discharge wherein effluent volumes comprise 10 percent or more of the receiving water volume (exclusive of previously discharged effluent) at point of access shall exceed that bacterial quality specified in Section 8047, Title 17, California Administrative Code.

Residual Chlorine

Wastewaters shall not contain free residual chlorine upon discharge.

DISCHARGE PROHIBITIONS

The following waste discharges shall be prohibited:

1. Any wastewater which has particular characteristics of concern to beneficial uses:

    a. Affecting ocean waters over rocky intertidal substrates or within 1000 feet offshore from the extreme low water line and where the waste will not receive a minimum dilution ratio of 100:1 as it reaches the surface.

    b. At any point at which the wastewater does not receive an initial dilution of at least 10:1.

    c. Into any nontidal water, lake, dead-end tidal slough or similar confined water area or their immediate tributaries.

Exceptions to the above will be considered for certain wet weather discharges and other discharges having a high initial dilution where an inordinate burden would be placed on the discharger relative to beneficial uses protected and when an equivalent level of environmental protection can be achieved by alternate means. Exceptions will also be considered where a discharge is approved as part of a reclamation project or where it can be demonstrated that environmental benefits will be derived as a result of the discharge.

    d. To Tomales Bay, Drakes and Limantour Esteros or Bolinas Lagoon.

2. Discharges of sewage or industrial wastes into or in the vicinity of areas of special biological significance when necessary to protect these areas.

3. Sewage-bearing wastewater, garbage, oil, litter, debris, or wastes of any nature from vessels to the waters of San Francisco Bay, Tomales Bay, Bolinas Lagoon, Drakes and Limantour Esteros, and Princeton Harbor, vessel washdown water is excepted.

4. Floatable rubbish, refuse, bark, sawdust or other solid wastes into surface waters or at any place where it may contact surface waters, including flood plain areas.

5. Floating oil or other floating materials from any activity in quantities sufficient to cause deleterious bottom deposits, turbidity or discoloration in surface waters.

DISCHARGE PROHIBITIONS
(Continued)

6. Silt, sand, clay or other earthen materials from any activity in quantities sufficeint to cause deleterious bottom deposits, turbidity, or discoloration in surface waters.

7. Sludges of sewage or industrial waste origin.

8. Biocides of a persistent or cumulative form when applied over waters or near shoreline areas where direct discharge to water is threatened.

9. Radiological, chemical, or biological warfare agent or high-level radioactive waste.

10. Bypassing of untreated waste, regardless of dilution provided.

part VI
Appendices

Appendix C Proposed S.W.R.C.B. "Bays and Estuaries" Policy

State of California
The Resources Agency

STATE WATER RESOURCES CONTROL BOARD

PROPOSED WATER QUALITY CONTROL POLICY FOR THE ENCLOSED BAYS AND ESTUARIES OF CALIFORNIA

NOVEMBER, 1973

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WATER QUALITY CONTROL POLICY FOR THE ENCLOSED BAYS AND ESTUARIES OF CALIFORNIA[1/]

INTRODUCTION

The purpose of this policy is to provide water quality principles and guidelines for the protection of beneficial uses of bay and estuarine waters.

Beneficial uses of bay and estuarine waters of the State that shall be protected may include, but are not limited to, domestic, municipal, agricultural, and industrial supply, power generation, recreation, aesthetic enjoyment, navigation, and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.[2/] Water quality standards which afford protection for designated beneficial uses shall be promulgated in the Comprehensive Water Quality Control Plans pursuant to Section 303 of the Federal Water Pollution Control Act-1972. The regulation of waste discharges to bays and estuaries, through the development of appropriate Comprehensive Water Quality Control Plans and by State and regional board adoption of waste discharge requirements, shall be consistent with the provisions of this policy. Since the quality of estuarine waters may not only be affected by waste disposal activities, but may also be critically affected by the volume flow of fresh water tributaries, the State Board may, as a condition for granting a permit to store fresh water, require the permittee to release from storage reasonable quantities of water to estuaries or their tributaries for the purpose of protecting beneficial uses.[3/]

This policy sets forth general requirements and principles for managing water quality in bays and estuaries; specific numerical limitations for all significant parameters which affect established beneficial uses of bay and estuarine waters shall be promulgated by regional boards in the Comprehensive Water Quality Control Plans.

CHAPTER I.

PRINCIPLES FOR MANAGEMENT OF WATER QUALITY IN BAYS AND ESTUARIES

It is the policy of the State Board that the discharge of municipal wastes and industrial process waters (exclusive of cooling water discharges) to bays and estuaries, other than the San Francisco Bay-Delta system, be phased out at the earliest practicable date. Exceptions to this provision may be obtained only upon demonstration to the satisfaction of the State and regional board that the wastewater in question would consistently be treated to such a high level that its discharge would enhance the quality of receiving waters above that which would occur naturally.[4/]

The following policies and guidelines are to be applied to the San Francisco Bay-Delta system:

1. In situations involving a choice between in-bay versus ocean disposal where a clear preference is not indicated by an analysis of environmental factors, prime consideration shall be given to the alternative which is more economical and/or offers the greater degree of flexibility for the implementation of wastewater reclamation options.
2. In evaluating the degree of protection provided to prevent chronic effects due to toxic materials contained in wastewaters, a receiving water final toxicity concentration of no greater than 0.04 toxic units in waters where the mean annual chlorosity exceeds 150 mg per liter shall apply.[5/]

3. Wastewater treatment and routing alternatives in which receiving water final toxicity concentrations would exceed 0.04 toxic units at any time may be considered only upon the demonstration of a compelling need for freshwater augmentation through the discharge of highly treated wastewaters. Furthermore, undiluted effluent toxicity concentrations may not exceed 0.59 toxic units on the average for any discharge which contributes significantly to a receiving water final toxicity concentration in excess of 0.04 toxic units. In such cases, a thorough evaluation of expected beneficial and possible detrimental effects resulting from excesses of the receiving water final toxicity concentration of 0.04 toxic units must be provided.

   Wastewater treatment and routing alternatives providing for the discharge of highly treated wastewaters for the purpose of freshwater augmentation shall be staged to the maximum extent practical whenever there is reason to believe that the receiving water final toxicity might exceed 0.04 toxic units. Sufficient time shall be provided between stages involving increased flows to adequately evaluate the effects of existing flows through an intensive monitoring program.

4. Nonpoint sources of pollutants must be controlled to the maximum extent practicable.

5. Bay or estuarine outfalls and diffusion systems must be designed to achieve the most rapid initial dilution[6/] and maximum dispersion as practicable to minimize concentrations of substances not removed by source control or treatment.

6. Wastes shall not be discharged into or adjacent to areas where the protection of beneficial uses requires spacial separation from waste fields.

CHAPTER II.

QUALITY REQUIREMENTS FOR WASTE DISCHARGES

1. In addition to any requirements of this policy, any more restrictive effluent limitations shall be as specified in Sections 301 and 302 of the Federal Water Pollution Control Act of 1972, and regional boards shall limit the mass emissions of substances as necessary to meet such limitations.

2. All dischargers of thermal wastes or elevated temperature wastes to bays and estuaries which are permitted pursuant to this policy shall comply with the "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California", State Water Resources Control Board, 1972, and with amendments and supplements thereto.

3. Radiological limits for waste effluents are as follows:

   a. Gross beta activity shall not exceed 100 pico-curies per liter (100 pCi/l or 1×10^{-7} Ci/ml) above the natural activity of source water.

   b. Gross alpha activity shall not exceed 30 pico-curies per liter (30 pCi/l or 0.3×10^{-7} Ci/ml) above the natural activity of source water.

   Compliance with radiological limits is to be determined by a yearly average of at least monthly values.

4. Dredge spoils to be disposed of in bays and estuarine waters must comply with federal criteria for determining the acceptability of dredge spoils to marine waters, and must be certified by the State or regional boards as in compliance with State plans and policies.

CHAPTER III.

DISCHARGE PROHIBITIONS

1. The discharge of municipal and industrial waste sludge and untreated sludge digester supernatant, centrate, or filtrate to bays and estuaries shall be prohibited.
2. The discharge or bypassing of untreated waste to bays and estuaries shall be prohibited.[7/]
3. The deposition of rubbish or refuse into surface waters or at any place where they would be eventually transported to the open waters of bays or estuaries shall be prohibited.[8/]
4. The direct or indirect discharge of silt, sand, soil clay, or other earthen materials from onshore operations including mining, construction, agriculture, and lumbering, in quantities which unreasonably affect or threaten to affect beneficial uses shall be prohibited.
5. The discharge of oil and materials of petroleum origin in sufficient quantities to be visible and/or in violation of waste discharge requirements shall be prohibited.
6. The discharge of any radiological, chemical, or biological warfare agent or high-level radioactive waste shall be prohibited.

CHAPTER IV.

GENERAL PROVISIONS

A. Effective Date

This policy is in effect as of the date of adoption by the State Water Resources Control Board.

B. Review and Revision of Plans, Policies and Waste Discharge Requirements

Provisions of existing or proposed policies or water quality control plans adopted by the State or regional boards for bays or estuaries shall be amended to conform with the applicable provisions of this policy.

Each appropriate regional board shall review and revise the waste discharge requirements for existing discharges as necessary to achieve compliance with this policy and State adopted water quality guidelines, and shall also establish a time schedule for compliance. Each regional board affected by this policy shall set forth for each discharge allowable average and maximum mass emission rates for each applicable effluent characteristic included in waste discharge requirements.

Regional boards shall finalize waste discharge requirements as rapidly as is consistent with the National Pollutant Discharge Elimination System permit program, but in no case later than January 1, 1975.

C. Monitoring Program

The regional board shall require dischargers to conduct self-monitoring programs and submit reports as necessary to determine compliance with waste discharge requirements. Such monitoring programs shall comply with applicable sections of the State Board's Administrative Procedures, and any additional guidelines which may be issued by the Executive Officer of the State Board.

FOOTNOTES

1/ Enclosed bays are indentations along the coast which enclose an area of oceanic water within distinct headlands or harbor works. Enclosed bays include all bays where the narrowest distance between headlands or outer most harbor works is less than 75 percent of the greatest dimension of the enclosed portion of the bay. This definition includes, but is not limited to: Humboldt Bay, Bodega Harbor, Tomales Bay, Drakes Estero, San Francisco Bay, Carmel Bay, Morro Bay, Los Angeles-Long Beach Harbor, Upper and Lower Newport Bay, Mission Bay, and San Diego Bay.

Estuaries, including coastal lagoons, are waters at the mouths of streams which serve as mixing zones for fresh and ocean waters during a major portion of the year. Mouths of streams which are temporarily separated from the ocean by sandbars shall be considered as estuaries. Estuarine waters will generally be considered to extend from a bay or the open ocean to a point upstream where there is no significant mixing of freshwater and seawater. Estuarine waters shall be considered to extend seaward if significant mixing of fresh and saltwater occurs in the open coastal waters. Estuarine waters include, but are not limited to, the Sacramento-San Joaquin Delta, as defined by Section 12220 of the California Water Code, Suisun Bay, Carquinez Strait downstream to Carquinez Bridge, and appropriate areas of the Smith, Klamath, Mad, Eel, Noyo, and Russian Rivers.

2/ Each appropriate regional board will establish specific beneficial uses and determine those portions of bays and estuaries to be protected for each of these beneficial uses.

3/ Many important estuarine dependent species can only live within a specific range of salinities; hence, their continued existence in a given area is dependent on the maintenance of an appropriate salinity gradient. Anadromous fish also require the gradual salinity gradient within estuaries in order to acclimate to changing osmotic conditions during their migrations. Improper management of the flow of fresh water to estuaries may alter the salinity gradient to the detriment of these important life forms. From another standpoint, restrictions of freshwater flow can, if not carefully managed, result in elevated concentrations of dissolved solids in upstream source waters to the extent that beneficial uses are seriously impaired.

4/ Undiluted wastewaters covered under this provision must produce at least 90 percent survival of a standard test species in a 96-hour static or continuous flow bioassay test. Maintenance of at least 90 percent survival in 100 percent waste shall not by itself constitute sufficient evidence that the wastewater discharge would enhance the quality of receiving waters above that which would occur naturally.

5/ Final toxicity concentration shall be used to measure the acceptability of waters for supporting a healthy marine biota until improved methods are developed to evaluate biological response.

a. Effluent Toxicity Concentration of Wastewater (T_c)

Expressed in toxicity units (tu)

$$Tc\ (tu) = \frac{100}{96\text{-hr. TLm\%}}$$

b. Median Tolerance Limit (TLm%)

The TLm shall be determined by static or continuous flow bioassay techniques using standard test species.

When it is not possible to measure the 96-hr. TLm due to greater than 50 percent survival of the test species in 100 percent waste, the toxicity concentration shall be calculated by the expression:

$$T_c\ (tu) = \frac{\log\ (100 - S)}{1.7}$$

S = percentage survival in 100 percent waste

c. Receiving Water Final Toxicity Concentration

The <u>final toxicity concentration</u> (FT_c) is equal to the effluent toxicity concentration (T_c) divided by a dilution factor.

For areas where verified dispersion models have been developed (e.g., See <u>Dispersion Capabilities of San Francisco Bay</u> - <u>SWRCB 1972</u>), the appropriate dilution factors shall be those which are indicated by the model.

6/ Initial dilution zone is defined as the volume of water near the point of discharge within which the waste immediately mixes with the bay or estuarine water due to the momentum of the waste discharge and the difference in density between the waste and receiving water.

7/ This prohibition does not necessarily apply to cooling water streams which comply with the "Water Quality Control Plan for the Control of Temperature in Coastal and Interstate Waters and Enclosed Bays and Estuaries of California" - SWRCB (1972).

8/ Rubbish and refuse include any cans, bottles, paper, plastic, vegetable matter, or dead animals or dead fish deposited or caused to be deposited by man.

part VII

Appendices

Appendix D Water Quality Control Plan — Ocean Waters of California

WATER QUALITY CONTROL PLAN

Ocean Waters of California

STATE OF CALIFORNIA

STATE WATER RESOURCES CONTROL BOARD

State of California
The Resources Agency

STATE WATER RESOURCES CONTROL BOARD

WATER QUALITY CONTROL PLAN FOR OCEAN WATERS OF CALIFORNIA

Adopted and Effective

July 6, 1972

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STATE WATER RESOURCES CONTROL BOARD
RESOLUTION NO. 72-45

WATER QUALITY CONTROL PLAN
FOR
OCEAN WATERS OF CALIFORNIA

WHEREAS:

1. The Board finds it necessary to promulgate water quality objectives and effluent quality requirements to govern the disposal of waste into the coastal waters of California;

2. The Board, after extensive review and analysis of testimony received at public hearings, has determined that protection of beneficial uses of the ocean waters of the State will require maximum practicable control of waste substances which may unreasonably impair those uses;

3. The Board finds that maximum practicable control of waste can be achieved through a comprehensive program which combines source control of waste and modern waste treatment technology;

4. The Board believes that application of current technology through intelligent design of control systems rather than irrational specification of arbitrary treatment methods can provide the highest degree of water quality protection without unreasonable cost;

5. The Board intends to implement monitoring programs to determine compliance with water quality objectives and effluent quality requirements, and to yield other information such as the effectiveness of source control programs and the identification of any short-term or long-term degradation of marine biota;

6. The Board intends to review all available data from time to time to determine the efficacy of control programs for protecting water quality;

THEREFORE, BE IT RESOLVED, that

1. The Board hereby adopts the "WATER QUALITY CONTROL PLAN FOR OCEAN WATERS OF CALIFORNIA"

2. The Board hereby directs all affected California Regional Water Quality Control Boards to implement the provisions of the PLAN.

3. The Board hereby directs its Executive Officer to issue guidelines for monitoring the effects of waste discharges to the ocean at the earliest possible date.

4. The Board hereby declares its intent to determine from time to time the need for revising the PLAN to assure that it reflects current knowledge of water quality objectives necessary to protect beneficial uses of ocean waters and that it is based on latest technological improvements.

CERTIFICATION

The undersigned, Executive Officer of the State Water Resources Control Board, does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on July 6, 1972.

Bill B. Dendy

Bill B. Dendy
Executive Officer

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

WATER QUALITY CONTROL PLAN FOR OCEAN WATERS OF CALIFORNIA

In furtherance of legislative policy set forth in Section 13000 of Division 7 of the California Water Code (Stats. 1969, Chap. 482) and pursuant to the authority contained in Section 13170 (Stats. 1971, Chap. 1288) the State Water Resources Control Board hereby finds and declares that protection of the quality of the ocean waters for use and enjoyment by the people of the State requires control of the discharge of waste[1/] to ocean waters[2/] in accordance with the provisions contained herein.

CHAPTER I. BENEFICIAL USES

The beneficial uses of the ocean waters of the State that shall be protected include industrial water supply, recreation, esthetic enjoyment, navigation, and preservation and enhancement of fish, wildlife, and other marine resources or preserves.

CHAPTER II. WATER QUALITY OBJECTIVES

This chapter sets forth limits or levels of water quality characteristics for ocean waters to ensure the reasonable protection of beneficial uses and the prevention of nuisance. The discharge of waste shall not cause violation of these objectives.[3/]

A. Bacteriological Characteristics

1. Within a zone bounded by the shoreline and a distance of 1,000 feet from the shoreline or the 30-foot depth contour, whichever is further from the shoreline, and in areas[4/] outside this zone used for body-contact sports, the following bacteriological objectives shall be maintained throughout the water column:

    Samples of water from each sampling station shall have a most probable number of coliform organisms less than 1,000 per 100 ml (10 per ml); provided that not more than 20 percent of the samples at any sampling station, in any 30-day period, may exceed 1,000 per 100 ml (10 per ml), and provided further that no single sample when verified by a repeat sample taken within 48 hours shall exceed 10,000 per 100 ml (100 per ml).

Adopted by the State Water Resources Control Board by Resolution No. 72-45 on July 6, 1972.

2. At all areas[4/] where shellfish may be harvested for human consumption, the following bacteriological objectives shall be maintained throughout the water column:

   The median total coliform concentration shall not exceed 70 per 100 ml, and not more than 10 percent of the samples shall exceed 230 per 100 ml.

B. Physical Characteristics

1. Floating particulates and grease and oil shall not be visible.

2. The concentration of grease and oil (hexane extractables) on the water surface shall not exceed 10 mg/m^2 more than 50 percent of the time, nor 20 mg/m^2 more than 10 percent of the time.[5/]

3. The concentration of floating particulates of waste origin on the water surface shall not exceed 1.0 mg dry weight/m^2 more than 50 percent of the time, nor 1.5 mg dry weight/m^2 more than 10 percent of the time.[5/]

4. The discharge of waste shall not cause esthetically undesirable discoloration of the ocean surface.

5. The transmittance of natural light shall not be significantly[6/] reduced at any point outside the initial dilution zone.[7/]

6. The rate of deposition of inert solids and the characteristics of inert solids in ocean sediments shall not be changed such that benthic communities are degraded.[8/]

C. Chemical Characteristics

1. The dissolved oxygen concentration[9/] shall not at any time be depressed more than 10 percent from that which occurs naturally.

2. The pH[9/] shall not be changed at any time more than 0.2 units from that which occurs naturally.

3. The dissolved sulfide concentration of waters in and near sediments shall not be significantly[6/] increased above that present under natural conditions.

4. The concentration of substances set forth in Chapter IV, Table B, in marine sediments shall not be significantly[6/] increased above that present under natural conditions.

5. The concentration of organic materials in marine sediments shall not be increased above that which would degrade[8/] marine life.

6. Nutrient materials shall not cause objectionable aquatic growths or degrade[8/] indigenous biota.

D. Biological Characteristics

1. Marine communities, including vertebrate, invertebrate, and plant species, shall not be degraded.[8/]

2. The natural taste, odor, and color of fish, shellfish, or other marine resources used for human consumption shall not be altered.

E. Toxicity Characteristics

1. The final toxicity concentration shall not exceed 0.05 toxicity units.[10/]

F. Radioactivity

1. Radioactivity shall not exceed the limits specified in Title 17, Chapter 5, Subchapter 4, Group 3, Article 3, Section 30269 of the California Administrative Code.

CHAPTER III.
PRINCIPLES FOR MANAGEMENT OF WASTE DISCHARGES TO THE OCEAN

A. Waste management systems that discharge to the ocean must be designed and operated in a manner that will maintain the indigenous marine life and a healthy and diverse marine community.

B. Waste discharged to the ocean must be essentially free[11/] of:

1. material that is floatable or will become floatable upon discharge,

2. settleable material or substances that form sediments which degrade[8/] benthic communities or other aquatic life,

3. substances toxic to marine life due to increases in concentrations in marine waters or sediments,

4. substances that significantly decrease the natural light to benthic communities and other marine life, and

5. materials that result in esthetically undesirable discoloration of the ocean surface.

C. Ocean outfalls and diffusion systems must be designed to achieve rapid initial dilution[12/] and effective dispersion to minimize concentrations of substances not removed by treatment.

D. Location of waste discharges must be determined after a detailed assessment of the oceanographic characteristics and current patterns to assure that:

1. pathogenic organisms and viruses are not present in areas where shellfish are harvested for human consumption or in areas used for swimming or other body-contact sports,[13/]

2. natural water quality conditions are not altered in areas designated as being of special biological significance, and

3. maximum protection is provided to the marine environment.

CHAPTER IV.
QUALITY REQUIREMENTS FOR WASTE DISCHARGES (EFFLUENT QUALITY REQUIREMENTS)

This chapter sets forth the quality requirements for waste discharges to the ocean.[3]

TABLE A

	Unit of measurement	Concentration not to be exceeded more than: 50% of time	10% of time
Grease and Oil (hexane extractables)	mg/l	10.	15.
Floating Particulates (dry weight)	mg/l	1.0	2.0
Suspended Solids	mg/l	50.	75.
Settleable Solids	ml/l	0.1	0.2
Turbidity	JTU	50.	75.
pH	units	within limits of 6.0 to 9.0 at all times.	

TABLE B

	Unit of measurement	Concentration not to be exceeded more than: 50% of time	10% of time
Arsenic	mg/l	0.01	0.02
Cadmium	mg/l	0.02	0.03
Total Chromium	mg/l	0.005	0.01
Copper	mg/l	0.2	0.3
Lead	mg/l	0.1	0.2
Mercury	mg/l	0.001	0.002
Nickel	mg/l	0.1	0.2
Silver	mg/l	0.02	0.04
Zinc	mg/l	0.3	0.5
Cyanide	mg/l	0.1	0.2
Phenolic Compounds	mg/l	0.5	1.0
Total Chlorine Residual	mg/l	1.0	2.0
Ammonia (expressed as nitrogen)	mg/l	40.	60.
Total Identifiable Chlorinated Hydrocarbons 14/	mg/l	0.002	0.004
Toxicity Concentration 10/	tu	1.5	2.0
Radioactivity		not to exceed the limits specified in Title 17, Chapter 5, Subchapter 4, Group 3, Article 5, Section 30285 and 30287 of the California Administrative Code.	

CHAPTER V.
DISCHARGE PROHIBITIONS

A. Hazardous Substances

The discharge of any radiological, chemical, or biological warfare agent or high-level radioactive waste into the ocean is prohibited.

B. Areas of Special Biological Significance

Waste shall be discharged a sufficient distance from areas designated as being of special biological significance to assure maintenance of natural water quality conditions in these areas.

C. Sludge

The discharge of municipal and industrial waste sludge and sludge digester supernatant directly to the ocean, or into a waste stream that discharges to the ocean without further treatment, shall be prohibited.

D. By-Passing

The by-passing of untreated waste to the ocean shall be prohibited.

CHAPTER VI.
GENERAL PROVISIONS

A. Effective Date

This plan is in effect as of the date of adoption by the State Water Resources Control Board. The less restrictive provisions of each of the extant policies and plans for the ocean shall be void and superseded by all applicable provisions of this plan.

B. Mass Emission Rates

In addition to receiving water objectives and effluent quality requirements, waste discharge requirements shall set forth the Maximum Allowable Daily Mass Emission Rate and the Maximum Allowable Monthly Mass Emission Rate for each effluent quality constituent included in the waste discharge requirements.

The Maximum Allowable Daily Mass Emission Rate for each constituent shall be calculated from the total waste flow occurring each specific day and the concentration specified in waste discharge requirements as that not to be exceeded more than 10 percent of the time. The mass emission rate of the discharge during any 24-hour period shall not exceed the Maximum Allowable Daily Mass Emission Rate.

The Maximum Allowable Monthly Mass Emission Rate for each constituent shall be calculated from the total waste flow occurring in each specific month and the concentration specified in waste discharge requirements as that not to be exceeded more than 50 percent of the time. The mass emission rate of the discharge during any monthly period shall not exceed the Maximum Allowable Monthly Mass Emission Rate.

C. Technical Reports

Persons responsible for existing waste discharges to the ocean shall be required by the Regional Board to submit a technical report prior to January 15, 1973. The technical report shall include but not be limited to:

1. A proposed program of improvement of waste treatment facilities necessary to assure compliance with all provisions of this plan.
2. A proposed time schedule for construction of necessary facilities.
3. An estimate of the capital cost of necessary facilities.
4. Any request, with supporting evidence, for less restrictive effluent quality requirements.
5. An analysis of all other factors deemed necessary by the Regional Board to permit establishment of waste discharge requirements.

For discharges exceeding 40 mgd the technical report shall include a correlation of the effluent quality requirements for the parameters set forth in Chapter IV, Table A, with all water quality objectives set forth in Chapter II, and with all effluent quality requirements set forth in Chapter IV, Table B.

D. Waste Discharge Requirements

The Regional Boards may establish more restrictive water quality objectives and effluent quality requirements than those set forth in this plan as necessary for the protection of beneficial uses of the ocean.

Effluent quality requirements shall not be less restrictive than those set forth in Chapter IV, Table B, of this plan.

Effluent quality requirements may be less restrictive than those set forth in Chapter IV, Table A, of this plan provided the Regional Board finds that the discharge shall comply with all water quality objectives set forth in Chapter II and all effluent quality requirements set forth in Chapter IV, Table B. Less restrictive effluent quality requirements shall be effective only upon approval by the State Board.

E. Revision of Waste Discharge Requirements

The Regional Board shall revise the waste discharge requirements for existing discharges as necessary to achieve compliance with this plan and shall also establish a time schedule for compliance. Prior to adoption, but not later than April 15, 1973, the Regional Board shall submit to the State Board all technical reports provided by the waste dischargers, proposed waste discharge requirements, and time schedules for compliance for all discharges to the ocean.

F. State Board Review of Time Schedules

The State Board shall review proposed time schedules for all municipal discharges throughout the State and shall recommend to the Regional Boards specific schedules to assure the maximum benefit from, and equitable distribution of, available state and federal grant funds.

G. Monitoring Program

The Regional Board shall require dischargers to conduct self-monitoring programs and submit reports necessary to determine compliance with the waste discharge requirements, and may require dischargers to contract with agencies or persons acceptable to the Regional Board to provide monitoring reports. Such monitoring programs shall comply with Guidelines for Monitoring the Effects of Waste Discharges on the Ocean which shall be issued by the Executive Officer of the State Board.

H. Areas of Special Biological Significance

Areas of special biological significance shall be designated by the State Board after a public hearing by the Regional Board and review of its recommendations.

FOOTNOTES

1/ This plan is not applicable to vessel wastes, the control of dredging, or the disposal of dredging spoil. Provisions regulating the thermal aspects of waste discharged to the ocean are set forth in the Water Quality Control Plan for the Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California dated May 18, 1972.

2/ Ocean waters are waters of the Pacific Ocean adjacent to the California coast outside of enclosed bays, estuaries, and coastal lagoons.

Enclosed bays are indentations along the coast which enclose an area of oceanic water within distinct headlands or harbor works. Enclosed bays include all bays where the narrowest distance between headlands or outermost harbor works is less than 75 percent of the greatest dimension of the enclosed portion of the bay. This definition includes but is not limited to: Humboldt Bay, Bodega Harbor, Tomales Bay, Drakes Estero, San Francisco Bay, Carmel Bay, Morro Bay, Los Angeles Harbor, Upper and Lower Newport Bay, Mission Bay, and San Diego Bay.

Estuaries and coastal lagoons are waters at the mouths of streams which serve as mixing zones for fresh and ocean waters during a major portion of the year. Mouths of streams which are temporarily separated from the ocean by sandbars shall be considered as estuaries. Estuarine waters will generally be considered to extend from a bay or the open ocean to the upstream limit of tidal action but may be considered to extend seaward if significant mixing of fresh and salt water occurs in the open coastal waters. The waters described by this definition include but are not limited to the Sacramento-San Joaquin Delta as defined by Section 12220 of the California Water Code, Suisun Bay, Carquinez Strait downstream to Carquinez Bridge, and appropriate areas of the Smith, Klamath, Mad, Eel, Noyo, and Russian Rivers.

Footnotes

3/ The Water Quality Objectives and Effluent Quality Requirements are defined by a statistical distribution when appropriate. This method recognizes the normally occurring variations in treatment efficiency and sampling and analytical techniques and does not condone poor operating practices. The 50 percentile value (concentration not to be exceeded more than 50 percent of the time) and 90 percentile value (concentration not to be exceeded more than 10 percent of the time) establish an acceptable distribution for any consecutive 30-day period. The distribution of actual sampling data for any consecutive 30-day period shall not have any percentile value exceeding that of the acceptable distribution.

4/ Body-contact sports areas outside the shoreline zone set forth in Chapter II. A.1. and all shellfishing areas shall be determined by the Regional Board on an individual basis.

5/ Surface samples shall be collected from stations representative of the area of maximum probable impact.

6/ The mean of sampling results for any consecutive 30-day period must be within one (1) standard deviation of the mean determined for natural levels for the same period.

7/ Initial Dilution Zone is the volume of water near the point of discharge within which the waste immediately mixes with ocean water due to the momentum of the waste discharge and the difference in density between the waste and the receiving water.

8/ Degradation shall be determined by analysis of the effects of waste discharge on species diversity, population density, growth anomalies, debility, or supplanting of normal species by undesirable plant and animal species.

9/ Compliance with water quality objectives shall be determined from samples collected at stations representative of the area within the waste field where initial dilution is completed. The 10 percent depression of dissolved oxygen may be determined after allowance for effects of induced upwelling.

10/ This parameter shall be used to measure the acceptability of waters for supporting a healthy marine biota until improved methods are developed to evaluate biological response.

a. Toxicity Concentration (Tc)

Expressed in Toxicity Units (tu)

$$Tc\ (tu) = \frac{100}{96\text{-hr. } TLm\%}$$

b. Median Tolerance Limit (TLm%)

The TLm shall be determined by static or continuous flow bioassay techniques using standard test species. If specific identifiable substances in wastewater can be demonstrated by the discharger as being rapidly rendered harmless upon discharge to the marine environment, the TLm may be determined after the test samples are adjusted to remove the influence of those substances.

When it is not possible to measure the 96-hr. TLm due to greater than 50 percent survival of the test species in 100 percent waste, the toxicity concentration shall be calculated by the expression:

$$Tc\ (tu) = \frac{\log\ (100 - S)}{1.7}$$

S = percentage survival in 100% waste.

c. Toxicity Emission Rate (TER)

Is the product of the effluent Toxicity Concentration (Tc) and the waste flow rate expressed as mgd.

$$TER\ (tu \cdot mgd) = Tc\ (tu) \times \text{Waste Flow Rate (mgd)}$$

d. Final Toxicity Concentration

(FTc) expressed in toxicity units (tu) shall be determined by a bioassay and estimated by the following calculations:

$$FTc\ (tu) = \frac{\text{Toxicity Emission Rate}}{\text{Initial Dilution Water + Waste Flow}}$$

$$= \frac{TER}{Qd + Qw}$$

e. Initial Dilution Water (Qd)

Shall be calculated as the product of estimated current velocity, effective diffuser length normal to the prevailing current, and effective mixing depth.

11/ Essentially free means the specific limitations set forth in Chapter IV of this plan.

12/ Diffusion systems should provide an initial dilution of wastewater with seawater exceeding 100 to 1 at least 50 percent of the time, and exceeding 80 to 1 at least 90 percent of the time. If a waste is essentially identical to natural seawater, less restrictive dilution requirements may be permitted by the Regional Board.

13/ Waste that contains pathogenic organisms or viruses should be discharged a sufficient distance from shellfishing and body-contact sports areas to maintain applicable bacteriological standards without disinfection. Where conditions are such that an adequate distance cannot be attained, reliable disinfection in conjunction with a reasonable separation of the discharge point from the area of use must be provided. Consideration should be given to disinfection procedures that do not increase effluent toxicity and that constitute the least environmental and human hazard in their production, transport, and utilization.

14/ Total Identifiable Chlorinated Hydrocarbons shall be measured by summing the individual concentrations of DDT, DDD, DDE, aldrin, BHC, chlordane, endrin, heptachlor, lindane, dieldrin, polychlorinated biphenyls, and other identifiable chlorinated hydrocarbons.